Golden Gate Commuter Ferryboat System

San Francisco-Marin Crossing

NEW

Golden Gate Commuter Ferryboat System

San Francisco Marin - Crossing

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NAVAL ARCHITECTS — MARINE ENGINEERS

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August 21, 1970

Golden Gate Bridge, Highway &
Transportation District
San Francisco, California 94129

Gentlemen:

In accordance with the Agreement of January 12, 1970, by and between the GOLDEN GATE BRIDGE, HIGHWAY & TRANSPORTATION DISTRICT and PHILIP F. SPAULDING & ASSOCIATES, INC., we are pleased to submit our design for a passenger ferry system and our recommendation for the optimum vessel design.

The ferry system is designed primarily for commute service, however, mid-day, evening and weekend service have been incorporated. Consideration was given to the fact that the ferry system is to be part of an integrated bus and ferry system, the one providing feeder service to the other. In an effort to provide highest feasibility for the proposed system, care was exercised to maximize the recreational use of the ferry system. The optimum vessel design incorporates all known features which will be as attractive an alternate as possible to the private automobile.

This report includes ship construction cost estimates, capital cost requirements, estimated crewing requirements, estimates for the cost of dredging and spoil disposal and that portion of the terminal design necessary for vessel servicing facilities. All regulatory agencies were consulted regarding the optimum vessel design to assure approval of the final design. To provide maximum flexibility in the implementation of the ferry system, it was designed so that service can be provided between San Francisco and any one of the Marin County terminals independently. Estimates of the minimum feasible level of service are included. Expected patronage growth for each route through 1980 is given.

We trust this report satisfactorily fulfills the Agreement and look forward to implementation of the Ferryboat System and final design of the optimum vessels.

Respectfully submitted,

Philip F. Spaulding
President

Charles F. Heye
Transportation Economist

Golden Gate Bridge District

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Introduction

Summary

The Golden Gate Bridge, Highway & Transportation District contracted with Philip F. Spaulding & Associates, Inc. on January 12, 1970, to design a commuter passenger ferry system between Marin County and the City and County of San Francisco. The District set forth the following system design parameters:

The ferry system is to operate between San Francisco in the vicinity of the Ferry Building and three terminals in Marin County. These three Marin terminals should be generally located in North Sausalito, Corte Madera, and in North Marin above Point San Pedro. Provision is also to be made in the systems design for possible service to Tiburon.

The ferry system is to be designed primarily for commuter service. Mid-day, evening and weekend service, however, is important, and should be provided. Consideration should be given to the fact that the ferry system is part of an integrated bus and ferry system and that it may be more efficient to utilize bus schedules during certain hours of the day. Consideration should also be given to ways in which recreational use of the ferry may be maximized.

In the design of the system and selection of the optimum vessel, maximum consideration will be given to those features which will attract the highest patronage. Comfort, speed, frequency and dependability of service are to be carefully considered so as to provide as attractive an alternate as possible to the private automobile.

In the course of preparing the system design, the following background data was correlated and analyzed for inclusion in this report:

Optimum Bus System, Marin County Transit District, August 1969.

Feasibility Study of San Francisco-Marin Ferry System, Arthur D. Little, Inc., July 1969.

Bay Area Transportation Report, Bay Area Transportation Study Commission, May 1969; Supplements II and III.

San Francisco-Marin Crossing, 1967, Division of Bay Toll Crossings, Transportation Agency, State of California.

Statistical Data Files, Golden Gate Bridge, Highway and Transportation District, together with many other planning agencies.

An analysis of all of this data reveals that the commuter vehicular traffic currently exceeds the design capacity of the bridge. Projected Marin County and north county population growth, together with the anticipated increase in bridge traffic, has reached a critical stage. (An immediate short term program must be undertaken in order to provide time for long range planning and financing for the ultimate solution to the bridge commuter traffic problem.)

The short term program is to provide a balanced transportation plan comprising the use of attractive commuter busses, together with comfortable commuter passenger ferries operating on the waters of San Francisco Bay.

It is the commuter passenger ferry segment of the balanced transportation plan that is the substance of this report.

The ferry boat terminal locations were selected objectively on the basis of water and land access to the primary natural commuter markets. Terminal costs, together with the ability to integrate the ferry terminal locations with all forms of land transportation both present and future, played an important role in site selection. In each case it was assumed that adequate free parking would be provided at each Marin County terminal and that a convenient feeder bus service would be provided for all terminals.

The ferry Building is an ideal site in San Francisco for commuters to the Central Business District and retains the flavor of tradition so important to Bay Area residents.

For the Southern Marin terminal it is strongly recommended that a centrally located site be selected in Sausalito rather than North Sausalito as set forth in the work statement because of navigational and scheduling problems related to the North Sausalito terminal. Corte Madera Creek either at Corte Madera or Larkspur best serves Central Marin commuter traffic. When traffic through Corte Madera Creek builds toward saturation, a North Marin Terminal located at Gallinas Creek would symphon off the Northern Marin commuters and be sufficient to warrant direct service to San Francisco. This report presumes that commuters from Tiburon will continue to be served by Harbor Carriers. A terminal has been included at Tiburon, however, for providing mid-day service during the Bay Circle Cruises.

By updating all of the background data, traffic projections were prepared for all terminal sites balanced by level of service, transit time and passenger comfort.

(continued on page 8)

Sonoma

Napa

Solano

Marin

Contra Costa

Alameda

San Francisco

N

Operating costs were analyzed for eleven different types of vessels ranging in speed from 15 knots to 35 knots and from three hundred to nine hundred and seventy-six passengers. All marine modes were considered including surface effect vessels, hydroski vessels, catamarans and hydrofoils.

For the Southern Marin service (Sausalito) two vessels, the M. V. Golden Gate (now in operation) and a similar type vessel will adequately handle the ferry commuter traffic projected for the next ten years.

Initially Central Marin (Corte Madera Creek) will require five 25 knot vessels 165 feet long carrying 636 passengers specially designed for the service. By 1975 a sixth vessel will be required and by 1977 service from Gallinas Creek by two Boeing 929 hydrofoils should be instituted. Should the service out of Corte Madera Creek build faster than anticipated, hydrofoil service out of Gallinas Creek can be accelerated.

This study projects that initially 5,169 daily commuters each way will use the Golden Gate Commuter Ferry System. By 1980 the system will build until it accommodates 9,194 daily commuters each way. Initially the proposed terminal to terminal transit time would be 30 minutes from Sausalito and 40 minutes from Corte Madera Creek. During the off peak period in mid-day two Corte Madera Creek vessels would engage in a Bay Circle Cruise or omnibus service from San Francisco stopping at Sausalito, Tiburon, Corte Madera and return with stop-over and transfer privileges to following ferry boats or to the optimum bus system.

It is estimated that the entire system can be implemented for $17,145,000, which includes vessels, dredging and floats and modest shore side terminal development.

On the basis of a 50¢ each way commuter fare and a $2.00 Bay Circle Cruise fare, the Golden Gate Commuter Ferry Boat System will cover all operating costs and show a net income of approximately $250,000.

Goal

The challenge to transportation designers is more than creating systems that are safe, efficient, and economical. Rather than designing strictly low cost systems, modern technology should be employed within the framework of community goals, pride, heritage, environs and available funds to best serve the needs and desires of those who will benefit from the service. Funds must be employed in combination with natural resources to achieve a constructive environmental design.

The goal of this study is to design a viable passenger ferryboat system as a key component of the total transportation complex serving the Golden Gate Corridor and to recommend the optimum vessel design for the system. This key will integrate existing and future land transportation modes with modern water transit while maximizing the use of San Francisco Bay's natural topography and beauty.

This system is primarily designed to serve commuters. It would enhance recreational opportunities for the bay area and provide both visitor and residents with a unique chance to enjoy the beautiful scenery of the Bay.

The opportunity exists to attain the goal of commuter and bridge relief with minimum amount of community disruption. These modern ferryboats may in time symbolize San Francisco Bay as the bridge does the Golden Gate.

Market

for
Ferryboat Service

The original graphic art design appearing on the preceding page symbolizes the imaginative nature of this transportation system. The three converging funnels represent the transportation modes; rectangular shapes conceptualize the land areas. Designer: Sig Derror.

Market Analyses

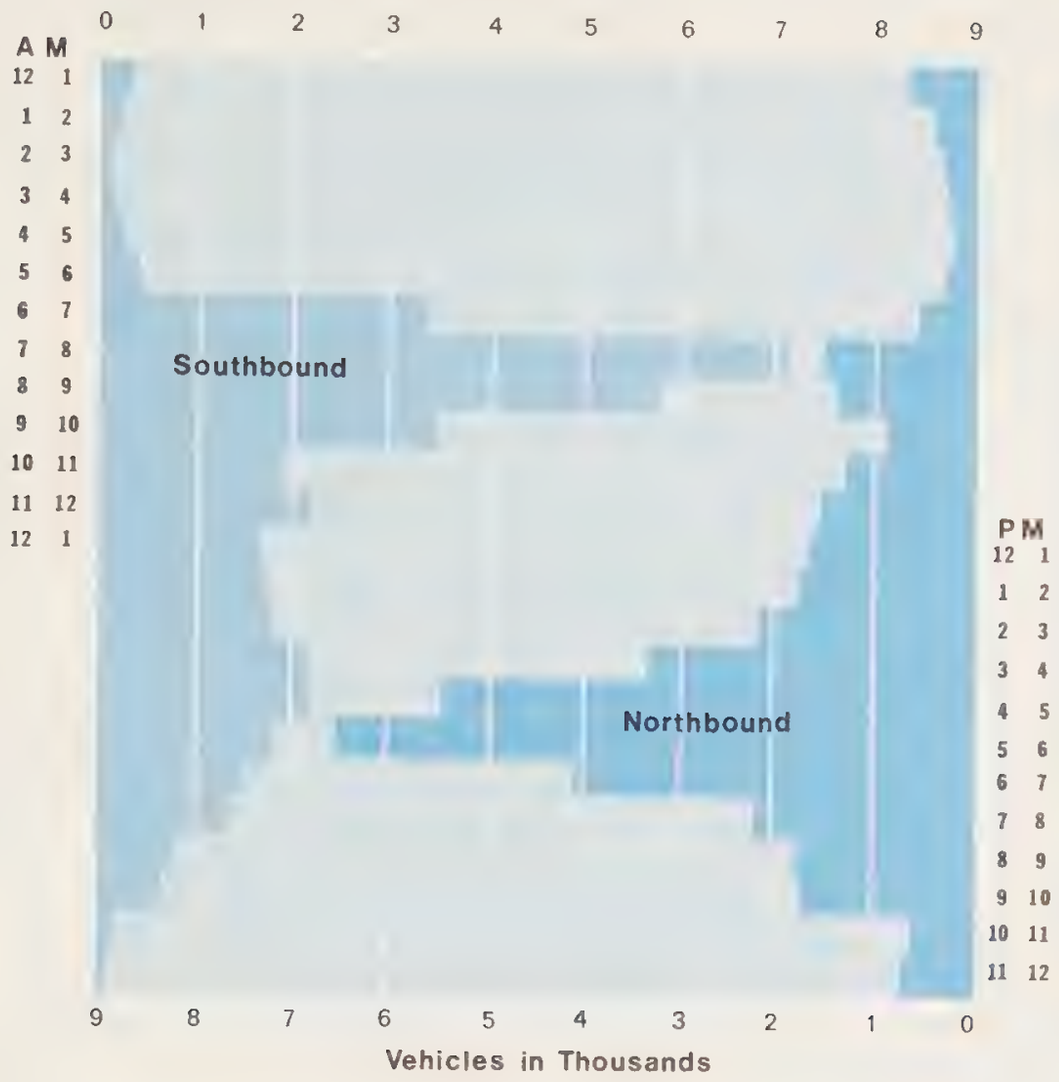
Streams of people, like those of water, seek routes of least resistance. Diversion is accomplished by impeding the existing flow or by providing new channels. At times the stream of people crossing the Golden Gate Corridor flows smoothly. At other times the periodic flood exceeds the design capacity and the flow is retarded, often brought to a stand-still. Larger or additional channels are urgently needed.

To provide significant relief to the main Corridor during peak periods, new channels must be sufficiently attractive to divert meaningful portions from the main stream without undue cost. Such attractiveness can be achieved by providing savings in time and money, increased comfort and convenience and more reliable and dependable service.

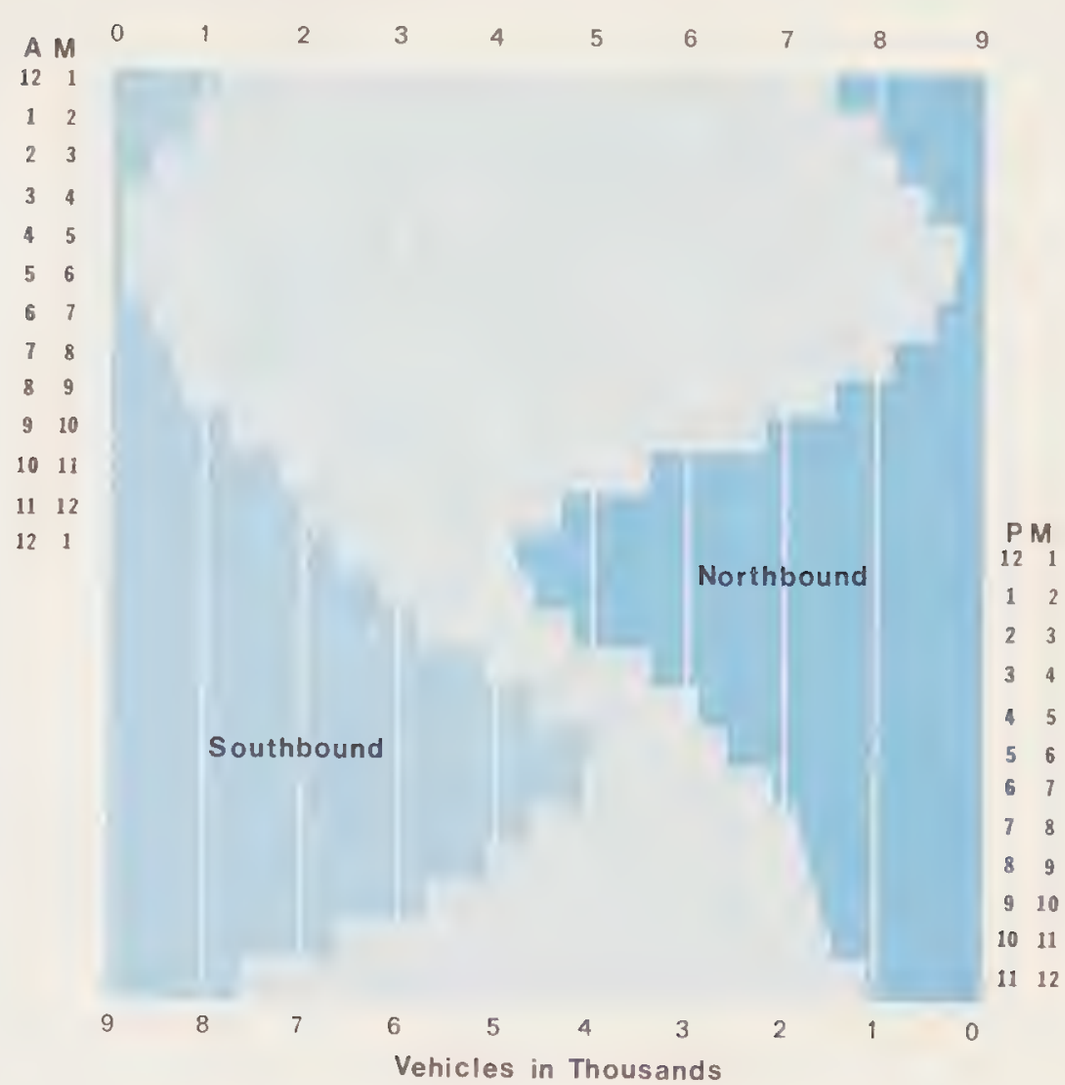
Although similar in many respects, there are major differences between the flow of water in stream beds and the flow of people. Streams of people are multi-directional; cross currents require complicated treatment, fluctuation in flows vary more frequently and violently, personal habits have greater bearing, etc. The weekday fluctuation of people driving across the Golden Gate Bridge is illustrated. The disproportionate weekday morning and evening peaks flood the Corridor and retard the flow for ever-increasing periods of time.

Weekend traffic through the Corridor and over the Bridge present a different set of problems, especially on Sundays and major holidays. The Sunday peak problem, for example, differs considerably from the weekday commuter problem in size, frequency, cause and solution. These differences require and receive separate treatment.

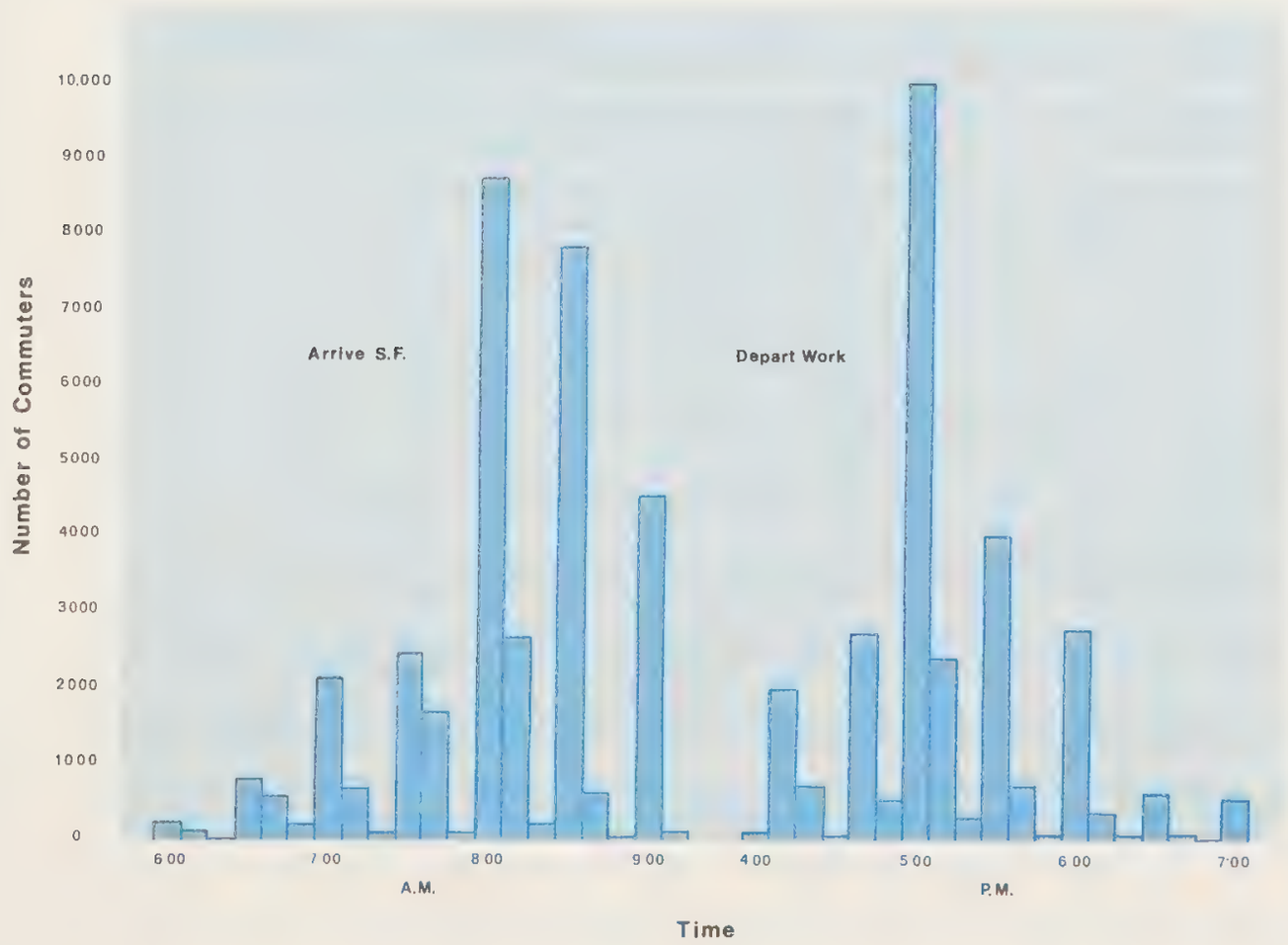
Weekday Vehicle Count *



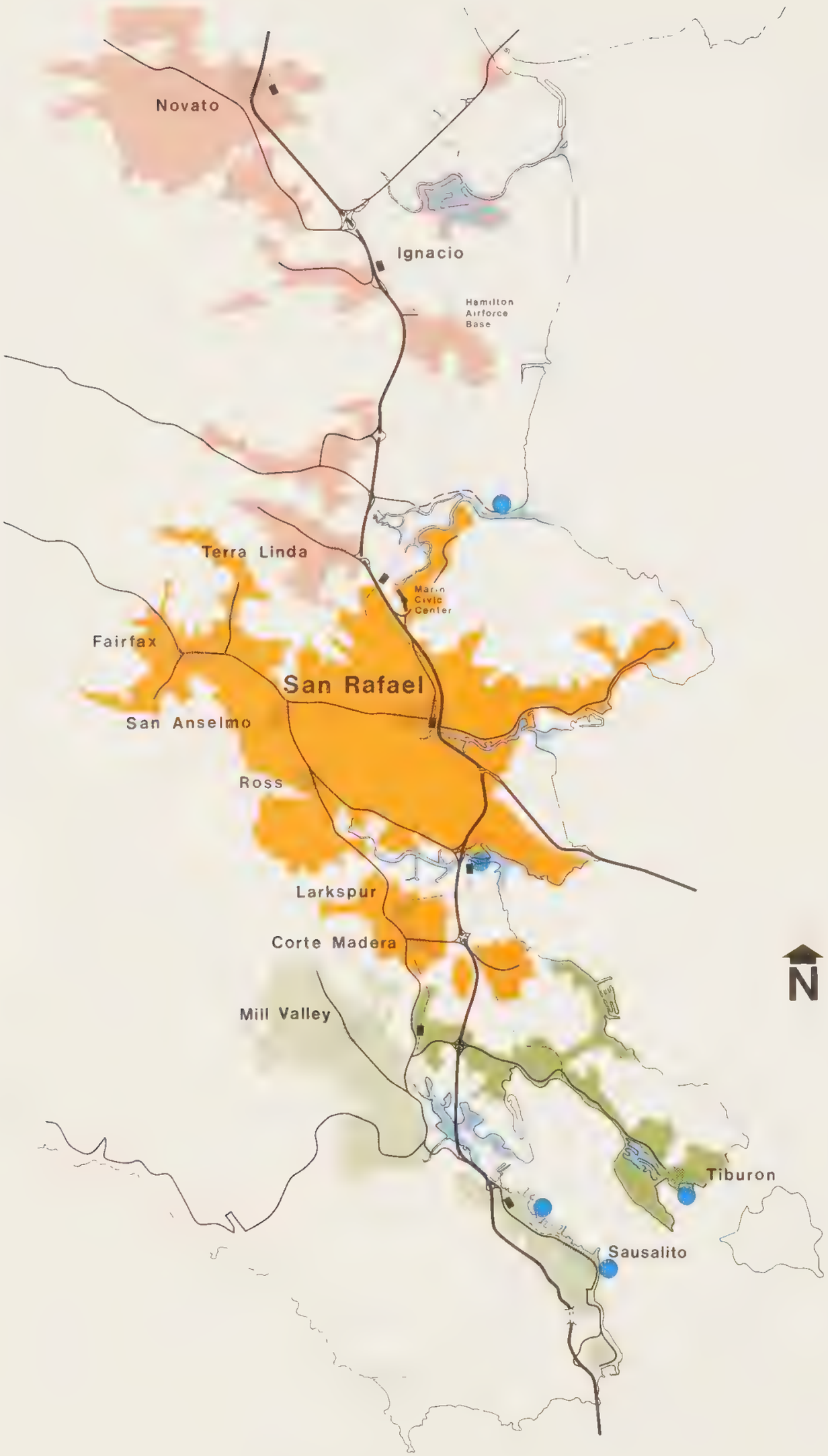
Sunday Vehicle Count, June 15, 1969 *



Estimated Commuter Flow 1972



* Source: Golden Gate Bridge District



Commuter Origins

Ninety-four percent of current Golden Gate Corridor commuters reside in Marin County. Their homes fill the valleys and flow up the ridges of a relatively narrow strip of land situated in the eastern third of the County. Marin County and its adjacent areas are divided into population clusters by these topographical boundaries. For the purpose of this study, Marin County will be divided as North, Central and South, with South comprising the subdivided markets: Tiburon Peninsula, and Sausalito/Mill Valley.

Commuters living in these population clusters form the natural market for transportation to and from San Francisco. The orientation map shows these clusters and principal transportation arteries.

Since 1955 Marin County commuter traffic has tripled in volume and is expected to double again by 1985. Population projections for the next 50 years show North Marin replacing Central Marin as most populous and, in turn, generating the most San Francisco bound commuters.

Sonoma and Napa Counties, north of Marin, currently contribute about six percent of the Golden Gate traffic. Similar in many respects to Marin County, they are destined to feed a greater number of commuters through the corridor in the future as they develop.

Distribution of San Francisco Bound Commuter Trip Origins by Census Tract

Originations	1968 Estimated Commuters	Percent Total	1972 Estimated Commuters	60% to CBD & O-CBD	To CBD (80%)	Primary[1] Market
Sonoma/Napa	1,900	6.0	2,100	1,260	1,008	1,120
Northwest	0	0.0	000	000	000	000
Northeast	2,710	8.5	2,975	1,785	1,428	1,587
Lucas Gallinas Valley	3,740	11.7	4,095	2,457	1,966	2,184
Total Northern Marin/Sonoma/Napa	8,350	26.2	9,170	5,502	4,402	4,891
San Geronimo Valley	260	0 8	280	168	134	149
San Rafael	3,860	12 1	4,235	2,541	2.033	2.259
Ros Valley	8,360	26 2	9,170	5,502	4,402	4,891
Total Central Marin	12,480	30 1	13,685	8,211	6,569	7,299
Tiburon	3,440	10 7	3,745	2,247	1,798	1,997
Sub Total · Tiburon	3,440	10 7	3,745	2,247	1,798	1,997
Mill Valley	5,060	15 8	5,530	3,318	2,654	2,949
Sausalito	2,500	7 8	2,730	1,638	1,310	1,456
West Marin	100	0.3	105	63	50	56
Sub Total Mill Valley Sausalito	7,660	23.7	8,365	5,019	4,014	4,461
Total: Southern Marin	11,100	34.4	12,110	7.266	5,812	6,458
Sub Total Marin County	30,030	94.0	32,865	19,719	15,775	17,528
Grand Total. Marin/Sonoma/Napa	31,930	100 0	34,965	20,979	16,783	18,648

[1]Primary Market· Commuters to Central Business District + 10% to Outer Central Business District

*Source: Marin County Transit District

Marin County Population and Commuters to San Francisco

Population Projections to 2020

District (1960 Census Tract)	1969 Population	Percent 1969 Total	Estimated Commuters as Percent Commuters 1969	Percent 1969 Dist. Pop.	Total Marin Commuters	Projected Population Growth 2020	Percent Total Projd. Growth	Projected Population 2020	% Total Projected Population	Change in Relative Importance
Northwest (33)	1,192	0.6		0.0	0.0	47,435	11.9	48,627	8.0	+7.4
Northeast (Novato) (1-5)	33,641	16.3	2,710	8.1	9.0	122,240	30.3	155,881	25.6	+9.3
San Rafael (6-12)	58,585	28.4	7,600	13.0	25.3	56,779	14.1	115,364	18.9	-9.5
San Geronimo (13) + Upper Ross Valley (14-18)	34,735	16.9	5,130	14.8	17.1	34,819	8.6	69,554	11.4	-5.5
Lower Ross Valley (19-22)	24,135	11.7	3,490	14.5	11.6	9,249	2.3	33,384	5.5	-6.2
Mill Valley-Sausalito (26-28) (39-31)	31,870	15.5	7,560	23.7	25.2	53,902	13.4	74,634	12.3	-3.2
West Marin (32)	6,720	3.3	100	1.5	0.3	67,714	16.8	85,772	14.1	+10.8
Tiburon (23-25)	15,144	7.4	3,440	22.7	11.5	10,770	2.7	25,914	4.3	-3.1
TOTALS	206,022	100.1	30,030	14.6	100.0	403,108	100.1	609,130	100.1	

Sources: Marin County Planning Department
Marin County Balanced Transportation Program
Marin County Transit District

Population and Commuter Projections

Marin and Sonoma Counties

Year	Marin County Population[1]	Marin County Commuters[4]	Sonoma County Population[2]	Sonoma County Commuters[4]	Total Commuters[4]	60% to CBD–OCBD[5]
1969	206,022	30,030[5]	223,000	1,900[5]	32,200 (31,000)[3]	19,393
1972	231,747	33,010	259,347	2,090	35,000	21,000
1980	336,300	46,230	317,150	2,925	49,155 (47,000)[3]	29,493
1990	429,500	71,793	403,000	4,542	76,335 (72,000)[3]	45,801

[1] Marin County Planning Department
[2] Sonoma County Select Citizens Committee, 1968
[3] Bay Area Transporation Study Commission, '69
[4] Spaulding & Associates Estimate
[5] Marin County Transit District

Analysis of Tiburon Ferry Survey

Findings from an analysis of the responses to the Bridge Survey of ferryboat patrons during January of this year are given. The destination distribution from this analysis shows clearly that the prime market for future Central Business District and the Outer Central Business District. The remainder of this market analysis dealing with commuters therefore concerns itself with this primary market.

Questionnaires distributed	350	100.0%
Questionnaires returned	321	91.7%

Distribution: 7:00 and 8:20 a.m. trips from Tiburon to San Francisco on two succeeding days in January, 1970.

Commuter Originations:

Corte Madera and North	10.51%	16.24%
Mill Valley	5.73%	
Strawberry Point	3.82%	
Tiburon	55.41%	83.75%
Belvedere	24.52%	

Destinations:

Central Business District	87.90%
Outer Central Business District	10.83%
Other San Francisco	1.27%

Arterials used between Ferry Building and Destinations

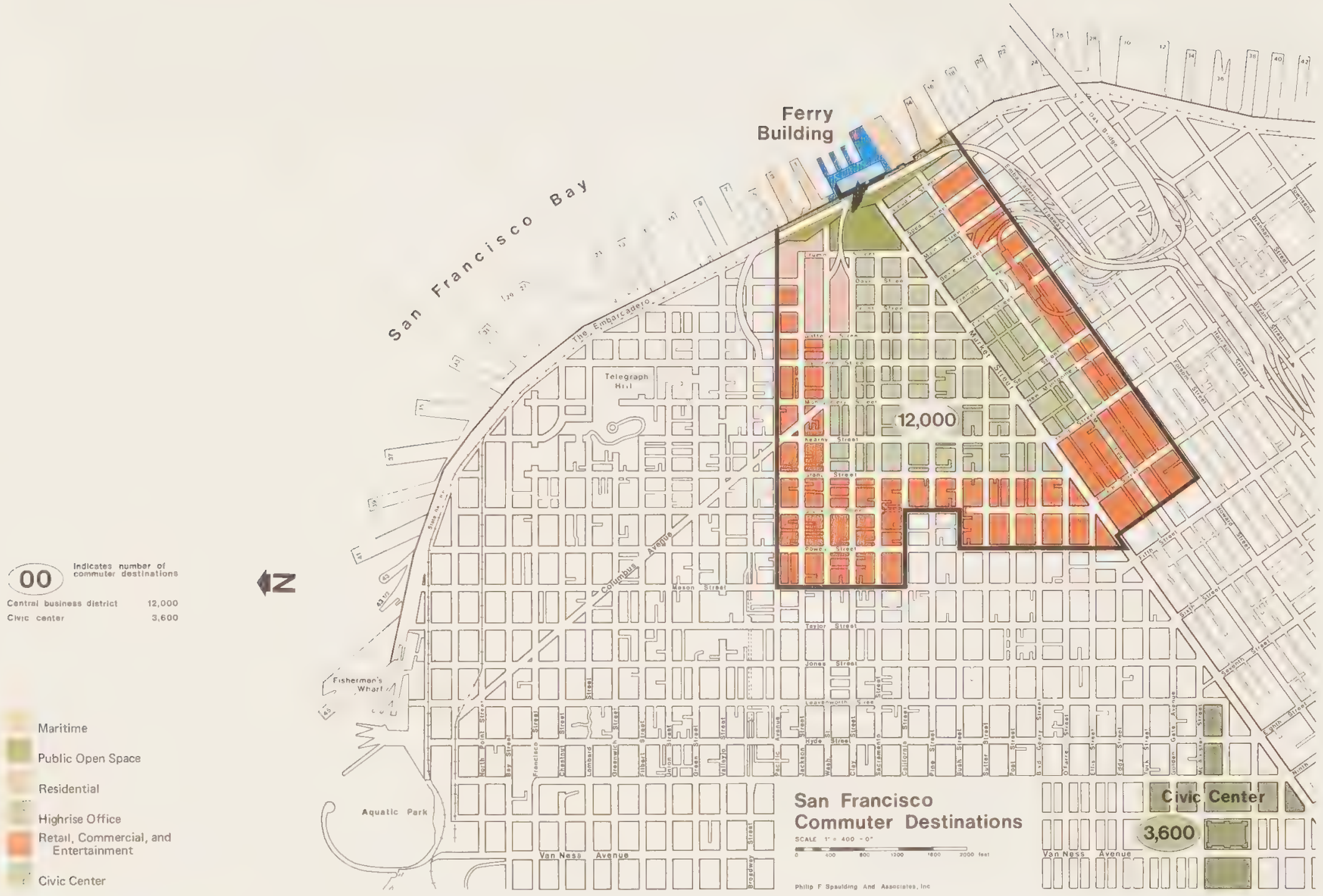
Per Cent of Total -
88-89% walked
9% public transportation

Per Cent of Central Business District Destinations only -
93% walked
7% public transportation or privately owned automobiles

Distribution of Questionnaires Returned (1) by Census Tract and (2) Compared to Marin County Transit District Origin-Destination Survey, 1968.

CBD Census Tract	1968 M.C.T.D.	1970 Tiburon
393	4.57%	2.54%
394	10.06%	11.96%
395	10.95%	9.78%
396	1.85%	2.54%
	27.43%	26.82%
21	25.48%	25.36%
22	12.37%	11.59%
23*	10.82%	9.78%
24	8.21%	3.26%
	56.88%	49.99%
52**	3.43%	1.81%
401	6.03%	9.78%
402	6.64%	10.87%
	16.10%	22.46%
	100.41%	99.27%†
Within 10 minute walk to/from Ferry Building	32%	35%
Within 20 minute walk to/from Ferry Building	68%	65%

*Central Financial District
**Area Being Redeveloped
†Error due to rounding



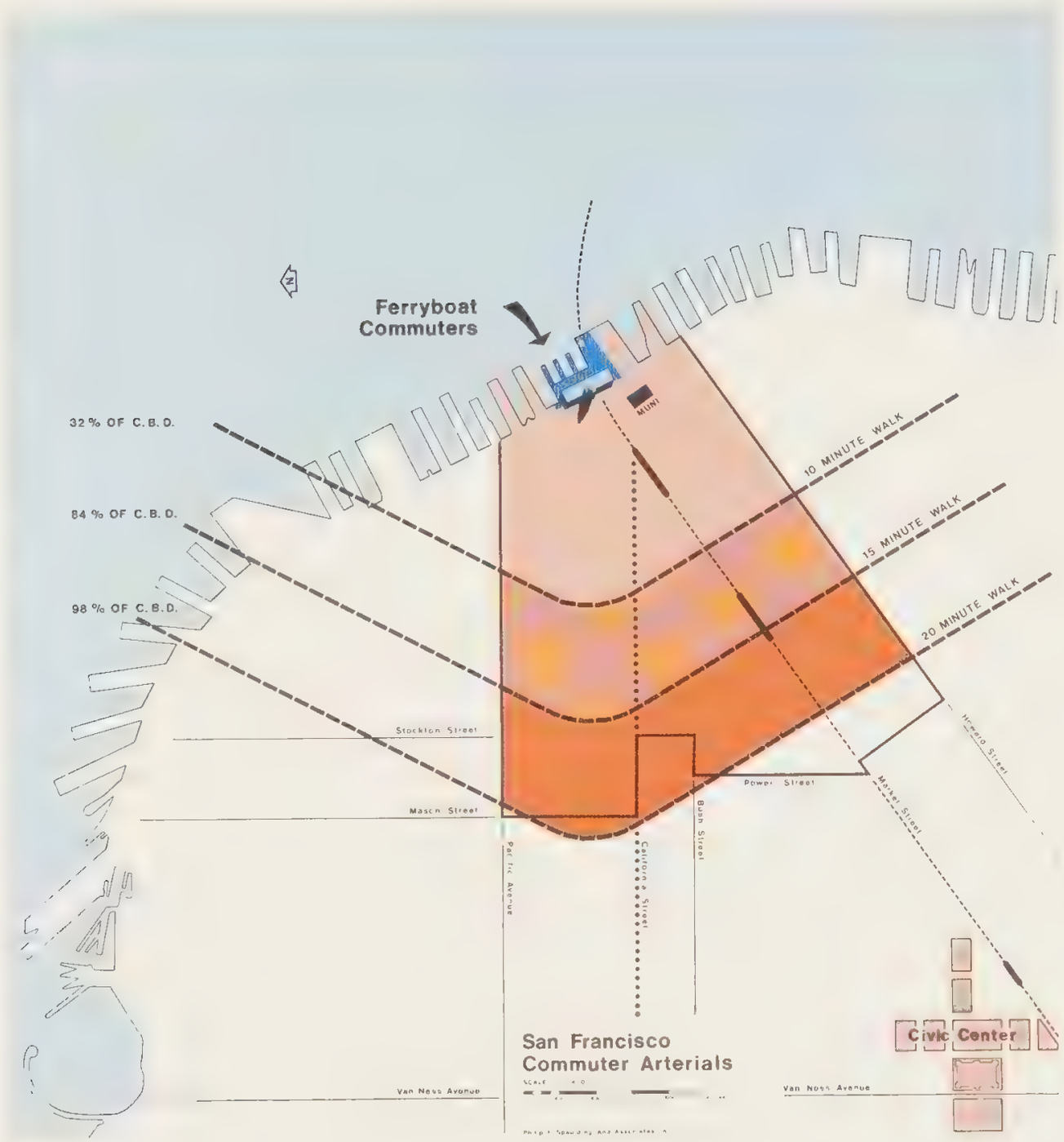
Destinations

Of the total number of weekday commuters entering San Francisco through the Golden Gate Corridor, approximately 60 per cent are destined to an area lying east of Van Ness Avenue and north of Howard Avenue. Of this 60 per cent, approximately 80 per cent are destined for the Central Business District, bounded roughly by Howard Avenue on the south, Powell on the west, Pacific on the north, and the Embarcadero on the east. The larger area is referred to as the Outer Central Business District.

The number of Marin/Sonoma/Napa commuters to San Francisco's Central and Outer Central Business Districts will increase at a more rapid rate than shown in the previous illustrations. Current developments in San Francisco bear this out. Since 1950, for example, San Francisco's commercial growth has occurred at a more rapid pace than residential or industrial growth. Residential growth has all but stagnated. The continuing growth of business in San Francisco is concentrated in commerce, trade, banking, finance, business services, tourism, and related areas. Headquarters for these activities are concentrated principally in the Central and Outer Central Business District. Many national and international firms have located, or plan to locate, headquarters in this area.

With its own population growth at a near stand-still, San Francisco will have to draw even more heavily on commuters to fill the newly created jobs. The interdependence of San Francisco with the several Bay Area counties will increase.

Physically, Downtown San Francisco is undergoing exciting and extensive changes. Two very significant re-development programs, the Golden Gateway and the Yerba Buena Centers, are bringing additional office buildings, hotels, restaurants, high-rise apartments, theaters, convention facilities, shops, and landscaped parks to the downtown area. Many plans are under consideration for developing the waterfront from the Ferry Building to Fisherman's Wharf. All of these developments have and will create additional employment.



Commuter Arterials

The plan map shows the various transportation modes available between the Ferry Building and the Central Business District. The most popular and often fastest is walking.

Personal checks showed that 98 percent of the Central Business District destinations can be reached by a 20 minute walk, 84 percent within 15 minutes, and 32 percent within 10 minutes.

Ferryboat and M. U. N. I. operators can mutually benefit by taking advantage of morning and evening directional flow. M. U. N. I. officials have pledged fullest cooperation in providing adequate feeder service for ferryboat commuters.

Concurrent with the redevelopment of downtown San Francisco are improved transportation facilities and services. B. A. R. T. will have stations along Market Street, between Davis and Drum Streets, at Powell Street, and the Civic Center.

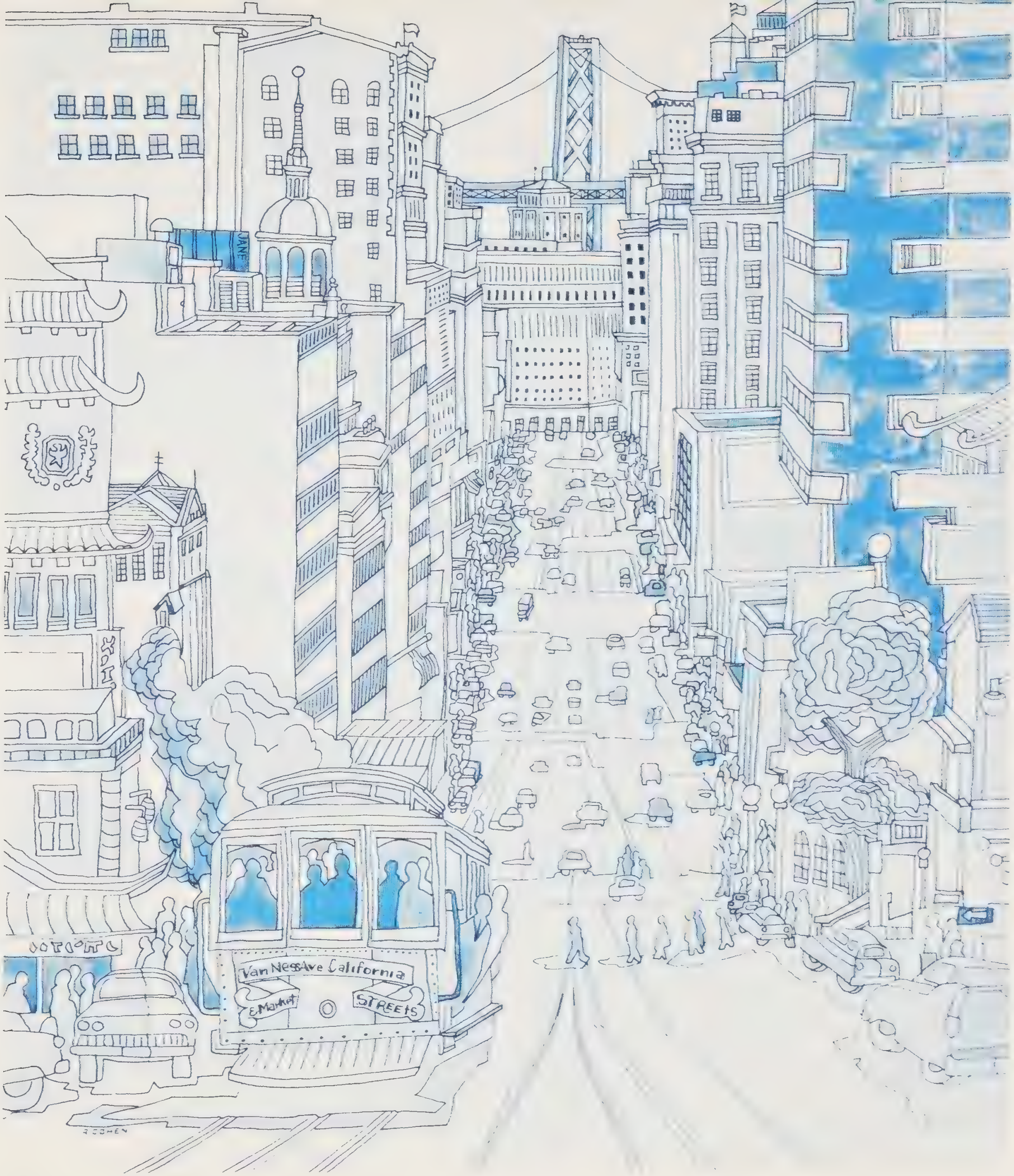
Legend

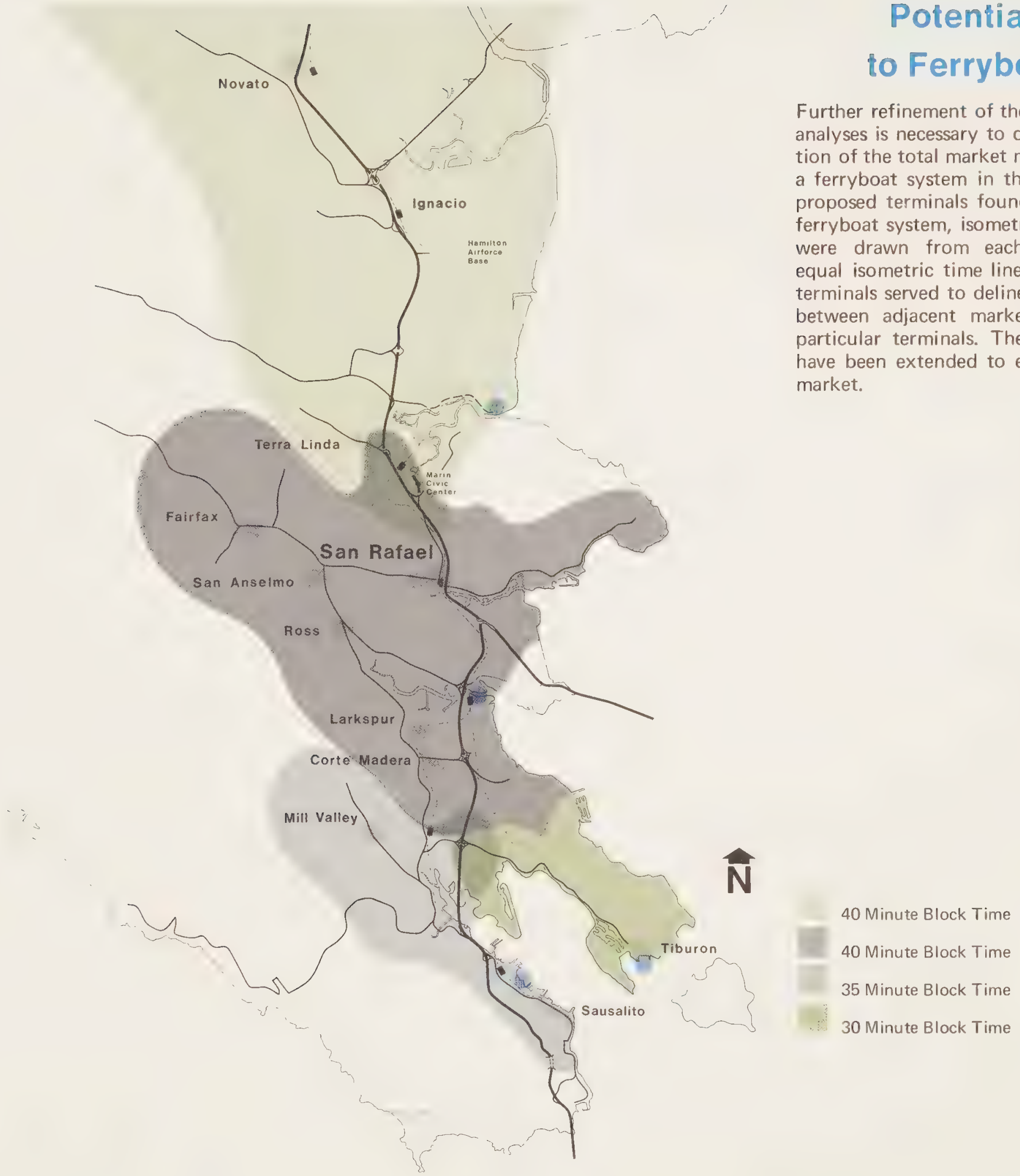
Walking Distance Time

MUNI Bus Terminal

Cable Cars

BART


JANE
Van Ness Ave
California
E. Market
STREETS



Potential Diversion to Ferryboat Service

Further refinement of the commuter market analyses is necessary to determine what portion of the total market might be diverted to a ferryboat system in the future. Using the proposed terminals found best suited for a ferryboat system, isometric travel time lines were drawn from each. Intersections of equal isometric time lines from neighboring terminals served to delineate the boundaries between adjacent market areas served by particular terminals. The ends of the lines have been extended to encircle a particular market.

Water Distance Between San Francisco and:	Via Ferryboat 1					Greyhound Bus 2		Optimum Bus System 3		Private Automobile 4	
	Service Speeds in Knots					Scheduled Time in Min.	Fares in ¢'s Commuter-Regular Commuter-Regular	Scheduled Time in Min.	Fares in ¢'s Commuter-Regular Commuter-Regular	Average Driving Time in Minutes	RT Cost in ¢'s Lo Estimate Hi Estimate
	15	20	25	30	35						
	Block Time in Minutes										
Gallinas Creek											
16.5 N. Mi.	78	60	50	45	40		78-105¢		62-85¢		300¢
(+5 minutes to	+5	+5	+5	+5	+5		156-189¢		124-153¢		920¢
Route 101)[2/]	83	65	55	50	45	50		54		45-55	
Corte Madera Creek							67-85¢	36.5	57-70¢	28-32	240¢
11.25 N. Mi.	60	45	40	35	30	36	134-153¢		114-126¢		612¢
								44			
Tiburon							73-100¢		57-70¢		278¢
5.6 N. Mi.	35	30	25	22.5	20	43	146-180¢	42	114-126¢	35-40	702¢
North Sausalito											
7.5 N. Mi.	45	35	30	27.5	25					35-30	
South Sausalito							50-70¢		42-60¢		210¢
5.5 N. Mi.	35	30	25	22.5	20	32	100-126¢	38	83-108¢	25-30	456¢

Travel Time and Cost Comparison

The next step was to hypothesize on ferryboat service which would be sufficiently attractive to divert significant numbers of commuters. Note the comparison of travel times (block) and cost; via private automobile, Greyhound bus, and the proposed Optimum Bus System between Marin County terminal areas and the San Francisco Ferry Building. These are contrasted with ferryboat block times at various speeds. This comparison indicates that ferryboat service should at least equal or better service times via bus wherever practical.

1. Ferryboat Block Time includes: transfer time, cast-off, maneuver, accelerate to service speed, decelerate to service speed, maneuver, dock and transfer time.

Five minutes is added to the Gallinas Creek block time to provide a comparable block time to those given for the other transport modes. This five minute access time to or from the junction of Highway 101 and Lucas Valley Road assumes an adequate access road.

2. Greyhound Bus service: The scheduled times, round trip and one way commuter and regular fares are derived from the published tariff in effect on March 15, 1970.

3. Optimum Bus System: Based upon data supplied by the Marin County Transit District and Marin County Balanced Transportation Program.

4. Private Automobile: Travel time is based on data supplied by Marin County Balanced Transportation Program, the Foley Study of 1967, observed times, and commuter reports. The times given assume a normal flow of traffic, no accidents or traffic jams. Travel costs are expressed in cents. Low estimates approximate "out-of-pocket" or marginal cost and are based upon 3¢/mile + 50¢ bridge toll + $1.00 all-day parking. High estimates approximate "fully allocated cost" or "average total cost" and are based on 15.4¢/mile + 50¢ bridge toll + $1.00 all-day parking. Both high and low cost estimates are considered conservative.

Model I 1972 Market	Daily Commuters	Commuters + Non-Commuters	Annual Gross Revenue in Thousands	**Service Assumptions** **Vessel Type and Speed** **Block Time** **Service Intervals, Peak Period** **One Way and Round Trip Fares**
A. Northern Marin	1,102	1,322		Via Corte Madera Creek 20 knot hi-speed displacement 45 minute block time 30 minute intervals 75¢ OW $1.50 RT
B. Central Marin	1,646	1,975		
Total A + B	2,748	3,298	$2,131	
C. Southern Marin				Via Tiburon [1/] 15 knot displacement 30 minute block time 30 minute intervals 50¢ OW $1.00 RT
1. Tiburon	568	682	$ 264	
2. Sausalito/Mill Valley	998	1,198	$ 516	Via North Sausalito [2/] 20 knot hi-speed displacement 35 minute block time 35 minute intervals 50¢ OW $1.00 RT
Total Southern Marin	1,566	1,880	$ 810	Via South Sausalito [2/] 15 knot displacement 30 minute block time 30 minute intervals 50¢ OW $1.00 RT
Total A + B + C	4,314	5,178	$2,941	

[1/] Report based upon Commuter service to Tiburon being provided by Harbor Carriers. No change in the existing service is contemplated.

[2/] AM & PM Commuter Service to both North and South Sausalito. Mid-day service to South Sausalito only with parking being provided at North Sausalito.

Demand Models

Following the comparison of travel time via the alternative modes of transport, four hypothetical demand models were constructed to determine diversion quantities under various assumptions regarding ferryboat travel time, service frequency, various combinations of craft, and fares. The frequency of service for all models was determined automatically by the number and size of vessels required to accommodate the peak periods.

Model I

This model is based on a 50¢ fare for service between San Francisco and Southern Marin terminals similar to that established by the Bridge when operating the Tiburon ferry. A 75¢ one way fare has been used for the Central Marin service which is comparable to commuter bus fare for that area.

The service assumptions have been based on the use of conventional craft with speeds of 15 knots for South Sausalito service and 20 knots for North Sausalito and Central Marin Service. North Marin would be accommodated through the Central Marin terminal.

Patronage estimates have been based on the operation of the Tiburon ferry. This experience shows that 25 percent of the

Model II 1972 Market	Daily Commuters	Commuters + Non-Commuters	Annual Gross Revenue in Thousands	Service Assumptions Vessel Type and Speed Block Time Service Intervals, Peak Period One Way and Round Trip Fares
A. Northern Marin	1,521	2,001		Via Corte Madera Creek 25 knot hi-speed displacement 40 minute block time 20 minute intervals 50¢ OW $1.00 RT
B. Central Marin	2,271	2,988		
Total A + B	3,792	4,989	$2,144	
C. Southern Marin				Via Tiburon [1/] 20 knot hi-speed displacement 20 minute block time 30 minute intervals 50¢ OW $1.00 RT
1. Tiburon	640	842	$ 363	
2. Sausalito/Mill Valley	1,275	1,678	$ 723	Via North Sausalito [2/] 20 knot hi-speed displacement 35 minute block time 35 minute intervals 50¢ OW $1.00 RT
				Via South Sausalito [2/] 20 knot hi-speed displacement 20 minute block time 30 minute intervals 50¢ OW $1.00 RT
Total Southern Marin	1,915	2,520	$1,085	
Total A + B + C	5,707	7,509	$3,234	

1/ Report based upon Commuter service to Tiburon being provided by Harbor Carriers. No change in existing service is contemplated.

2/ AM & PM Commuter Service to both North and South Sausalito. Mid-day service to South Sausalito only with parking being provided at North Sausalito.

Tiburon commuters were diverted to the ferry system. Weekday noncommuters were on a 1 to 5 ratio. Weekend and holiday traffic increased by: Saturdays 160%, Sundays 250% and Holidays 300%. The ratio of adults to children was 9 to 1 on Weekdays and 2 to 1 on Weekends and Holidays.

Tiburon is situated on a peninsula offering advantage to the ferry system when compared to other transportation modes. For this reason a 20% diversion factor has been used for all systems in this study.

This model formed the base demand for Systems III a & b, IV a & b, V a & b, VI a, b & c and VII a & b, with adjustments.

Model II

This model differs from Model I in that one way fare between Central Marin and San Francisco was reduced from 75¢ to 50¢.

Service to Central Marin was improved by the use of 25 knot vessels and South Sausalito with 20 knot vessels. The service to North Sausalito remained the same.

Higher patronage projections were derived from both the Tiburon experience and the A. D. Little Study. This model formed the base demand for System I a and Systems I b and II a & b with adjustments.

Model III 1972 Market	Daily Commutters	Commuters + Non-Commuters	Annual Gross Revenue in 000's Spaulding Estimate	Annual Gross Revenue in 000's A. D. Little	Service Assumptions Vessel Type and Speed Block Time Service Intervals, Peak Period One Way and Round Trip Fare
A. Northern Marin	1,381	1,657	$1,070	$ 740	Via Gallinas Creek 35 knot advanced marine system 40 minute block time 15 minute intervals 75¢ OW $1.50 RT
B. Central Marin	2,072	2,486	$1,606	$1,111	Via Corte Madera Creek 35 knot advanced marine system 30 minute block time 10 minute intervals 75¢ OW $1.50 RT
C. Southern Marin					Via Tiburon [1/] 35 knot advanced marine system 20 minute block time 20 minute intervals 75¢ OW $1.50 RT
1. Tiburon	585	702	$ 454	$ 314	
2. Sausalito/Mill Valley	1,200	1,440	$ 930	$ 643	Via North Sausalito [2/] 35 knot advanced marine system 25 minute block time 20 minute intervals 75¢ OW $1.50 RT Via South Sausalito [2/] 35 knot advanced marine system 20 minute block time 20 minute intervals 75¢ OW $1.50 RT
Total Southern Marin	1,785	2,141	$1,384	$ 957	
Total A + B + C	5,238	6,285	$4,060	$2,808	

1/ Report based upon the Commuter service to Tiburon being provided by Harbor Carriers. No change in existing service is contemplated.

2/ AM & PM Commuter Service to both North and South Sausalito. Mid-day service to South Sausalito only with parking being provided at North Sausalito service to South Sausalito only with parking being provided at North Sausalito.

Model III

This model together with Model IV is a modified version of the North, Central and South Marin service developed in the A. D. Little study.

All service is considered to be provided by advanced marine systems craft with speed capabilities of 35 knots or better. One way fares between all Marin terminals and San Francisco were assumed to be 75¢. Patronage estimates were based upon commuters destined only to the Central Business District (90 percent) and adjacent areas of the outer central business district in San Francisco (10 percent).

Model IV 1972 Market	Daily Commuters	Commuters + Non-Commuters	Annual Gross Revenue in 000's Spaulding Estimate	Annual Gross Revenue in 000's A. D. Little	Service Assumptions Vessel Type and Speed Block Time Service Intervals, Peak Period One Way and Round Trip Fares
A. Northern Marin	1,906	2,685	$1,156	$ 800	Via Gallinas Creek 35 knot advanced marine system 40 minute block time 12 minute intervals 50¢ OW $1.00 RT
B. Central Marin	2,860	4,028	$1,735	$1,200	Via Corte Madera Creek 35 knot advanced marine system 30 minute block time 6 minute intervals 50¢ OW $1.00 RT
C. Southern Marin					Via Tiburon [1/] 35 knot advanced marine system 20 minute block time 20 minute intervals 50¢ OW $1.00 RT
1. Tiburon	807	1,137	$ 490	$ 339	
2. Sausalito/Mill Valley	1,761	2,479	$1,068	$ 738	Via North Sausalito[2/] 35 knot advanced marine system 25 minute block time 20 minute intervals 50¢ OW $1.00 RT Via South Sausalito [2/] 35 knot advanced marine system 20 minute block time 20 minute intervals 50¢ OW $1.00 RT
Total Southern Marin	2,568	3,616	$1,558	$1,077	
Total A + B + C	7,334	10,329	$4,444	$3,077	

[1/] Report based upon Commuter service to Tiburon being provided by Harbor Carriers. No change in the existing service is contemplated.

[2] AM & PM Commuter Service to both North and South Sausalito. Mid-day service to South Sausalito only with parking being provided at North Sausalito.

Model IV

The service assumptions for this model are the same as Model IIIexcept that the one way fare has been reduced from 75¢ to 50¢.

These four demand models collectively provide a spectrum of reasonably realistic commuter patronage estimates based upon variations in service offered and fares charged. Although inherently not perfect, they reflect as realistically as possible what probably will occur under certain assumptions. Under a later section, "System Design," these four demand models will be used as a basis to evaluate various ferryboat candidates. The candidates will be tested in a variety of combinations and operated within the design parameters of the four demand models to determine the best candidate combination or combination of candidates, all things considered.


Destinations via water
1. Sausalito
2. Tiburon
3. Paradise Park
4. Angel Island
5. Alcatraz
6. McNears Beach
7. San Rafael
8. Mare Island
9. Treasure Island
10. Jack London
11. Point Bonita
12. Stinsons Beach
13. Bolineas
14. Drakes Bay
15. Point Reyes
16. Fishermans Wharf
Destinations via water & feeder sys.
17. Mt. Tamalpais
18. Muir Woods
19. Sam Taylor Park
20. Marin County Civic Center
21. San Francisco Int'l Airport
22. Oakland Int'l Airport
VALLEY FORD
To Santa Rosa
Dillons Beach
TOMALES
Camp Pistolies
NOVATO TOWNSHIP
NOVATO
SAN PABLO BAY
HAMILTON FIELD
VALLEJO
DRAKES BAY
PACIFIC
OCEAN
SAN RAFAEL
FAIRFAX
ROSS
LARKSPUR
MILL VALLEY
SAUSALITO
RICHMOND
BERKELEY
EMERYVILLE
OAKLAND
ALBANY
ALAMEDA
SAN PABLO
Recreation
Off-peak Potential
SCALE 5/8" = 1 Mile
0 1 2 4 6 Miles
Philip F Spaulding And Associates Inc

Recreational Weekend and Off–Peak Market

Noted earlier, this analysis deals primarily with the treatment of the Golden Gate corridor commuter problem. Typically, commuters peak in the mornings and in the afternoons. When capacity is provided to serve these daily peaks, a large portion of that capacity often remains idle during the off-peak periods and on weekends. Idle capacity is expensive and causes the average total cost of providing commuter service to be costly. Normally, when transit fares are raised to recover the cost of this idle capacity, transit passengers are diverted to alternate modes of transport. Revenues from the higher fares usually total less than before. Revenues obtained from increased utilization of the off-peak transit capacity actually reduce the cost of providing commuter service.

The Bay Area provides an excellent opportunity to find alternate uses for ferryboat capacity during off-peak weekday periods and on weekends. For example, ferryboats not required for regular service during the off-peak periods might be employed to serve tourists visiting the Bay Area. Unfortunately, too little research is available regarding this portion of the tourist market to make an accurate forecast of its potential. This deficiency becomes more significant when one considers that tourists visiting San Francisco alone exceed two million annually. For the Bay Area, the annual total of tourists is much greater.

There are a few sources that provide some information pertinent to the potential of tourist use of ferryboats. The Arthur D. Little Company conducted a study of the impact of The Port of San Francisco on the city, its future, and the potential of its northern waterfront in 1966. This study revealed that a bay cruise was the most preferred activity of both the first time visitors (57%) and repeat visitors (49%). Fisherman's Wharf was indicated as the number two attraction at the time. In its 1969 ferry feasibility study, Little estimated that 2,000 tourists would patronize a Bay ferry system on Saturdays and Sundays.

The Sunday Travel Survey conducted by the Golden Gate Bridge on October 5, 1969, is a second source. This survey provides significant information about the weekend travel habits of people residing in the Bay Area. The survey sample was taken between 4:00 and 10:00 p.m., covering the complete southbound peak travel period. Response to the survey was far above average. Thirty-three and one half percent of the total number of vehicles crossing the bridge during the survey period were represented. Of this 54 percent resided in San Francisco County, 78.5 per cent resided in counties surrounding the Bay and 21.5 percent, represented occupants residing beyond counties surrounding the Bay. This high percentage of "local" residents was borne out by the fact that 77.9 percent began their journey on the same day as the survey, 43.2 percent that morning and 43.7 percent that afternoon.

Of the nine primary purposes for taking the Sunday trip (October 5), a ferryboat service might have been used in whole or in part for all purposes with the possible exception of overnight camping (rated third) in that automobiles would probably have been required to transport gear to the campsites. When asked how often weekend travel to or through Marin County was made, the response was quite high for both summer and winter periods.

Most Weekends	35.6% Summers	21.6% Winters
Two or More per Month	55.6% Summers	37.2% Winters
One or More per Month	73.1% Summers	56.4% Winters

Regarding "Comments and Suggestions Repeated Most Often," it is interesting to note that ferries ranked second, showing more than twice the interest for ferries than that shown for rail rapid transit, a second crossing, or bus rapid transit.

In addition to those places visited by the Sunday traveler with normal off-peak scheduling, other weekend destinations and activities might be served by idle boats. These destinations in conjunction with bus service might include: Marin Civic Center, (a Frank Lloyd Wright masterpiece), and the Mill in Mill Valley.

Potential Direct Water Service to:

Alcatraz Island	Petaluma River to Petaluma
Treasure Island	Fisherman's Wharf
Mare Island	Jack London Square, Oakland
Paradise Beach Park	Stinson Beach
McNear's Beach	Bolinas

Evening and moonlight cruises might also prove to be a valuable market. Food and beverage service should be a valuable asset to weekend and off-peak market as well as daily commuter traffic.

Tiburon Experiment/Saturday and Sunday

The Bridge District's experimental operation of the Tiburon ferry proved to be a most valuable source of information. Shown is the relationship between weekday commuter travel, off-peak weekday travel, and weekend travel on Saturdays and Sundays.

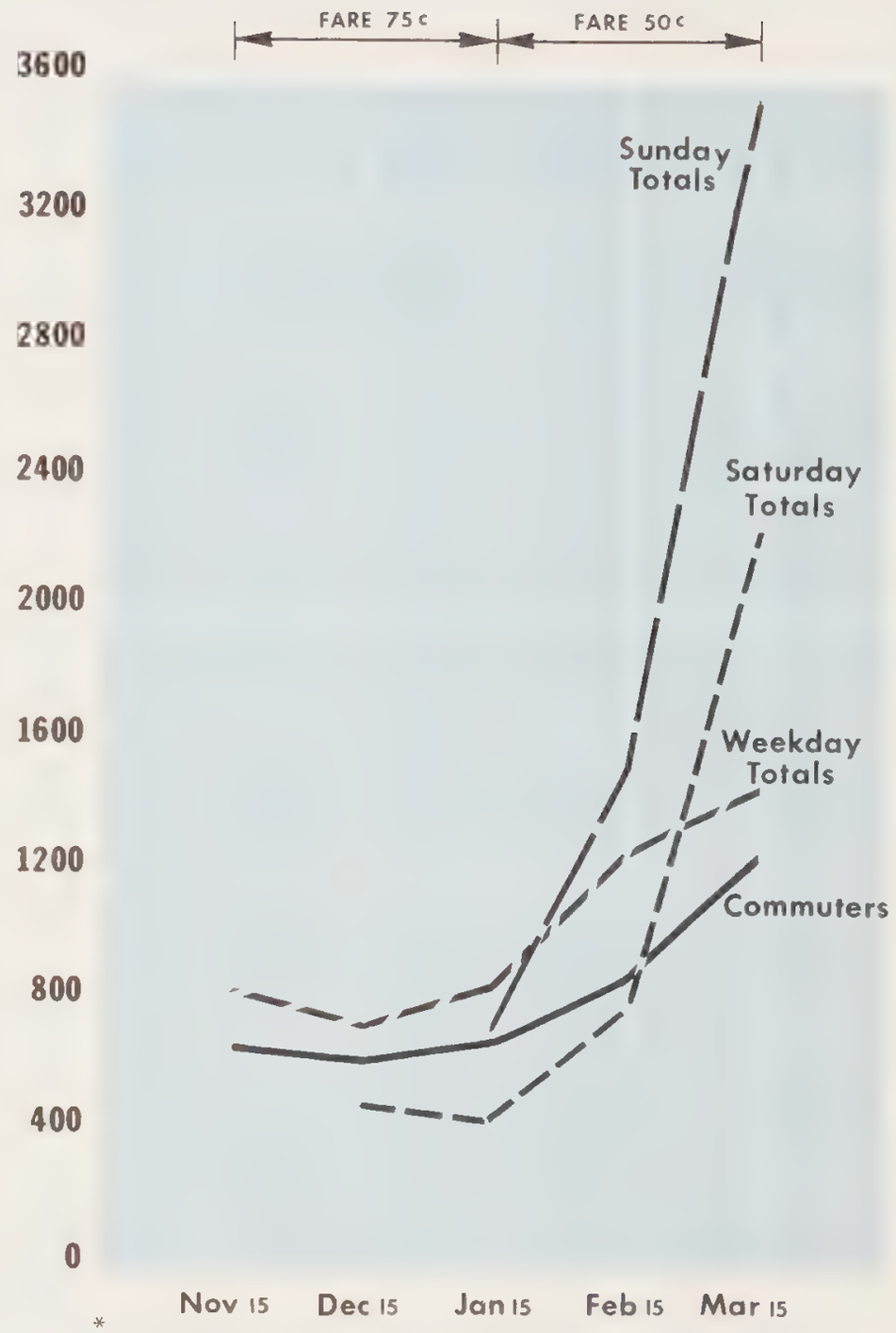
The Sunday service was a success from its beginning, January 18, 1970. The change in fares from 75¢ to 50¢ occurred before the commencement of the Sunday service so there is no way to measure its effect. Knowledge of the service resulting from very favorable newspaper stories was the most significant factor contributing to its immediate success.

Sunday passengers included both out-of-town tourists and local residents. Most were dressed quite informally and many had picnic baskets and cameras. Included were dating couples, families with babies in strollers, and pets with their masters.

Saturday service was being offered before and after the fare change. It would appear that the change in fare did have an effect on patronage, but the big upsurge in Saturday patronage more probably resulted from increased knowledge accruing from the newspaper publicity.

It is difficult to differentiate between the effect of the fare change and the increased publicity on the numbers of off-peak weekday passengers during the Tiburon experiment. The Optimum Bus Study reported that this market appeared more elastic than the commuter market. The Little sub-survey of housewives determined that fares were the over-riding consideration for non-commuters. Even though both the fare change and the increase in newspaper publicity occurred almost simultaneously, it is believed that the publicity had a greater effect on the increased patronage than did the fare change.

Although the available information on the off-peak and weekend market for ferryboat service is inadequate, there is sufficient evidence to indicate a sizable market. The importance of this market in relation to ferryboat utilization and cost cannot be overly emphasized.



* Bad weather days with trip cancellations omitted.

System Components

System Components

The primary components of a commuter passenger ferryboat system include terminals, water routes, and vessels. Terminals provide entry and exit funnels for passengers, water routes connect the terminals, and the vessels provide the transportation. These three components are the inseparable links in a system. Each must be designed to function as a part of the entire system. It is only for analytical purposes that each component is individually discussed.

Terminal Sites

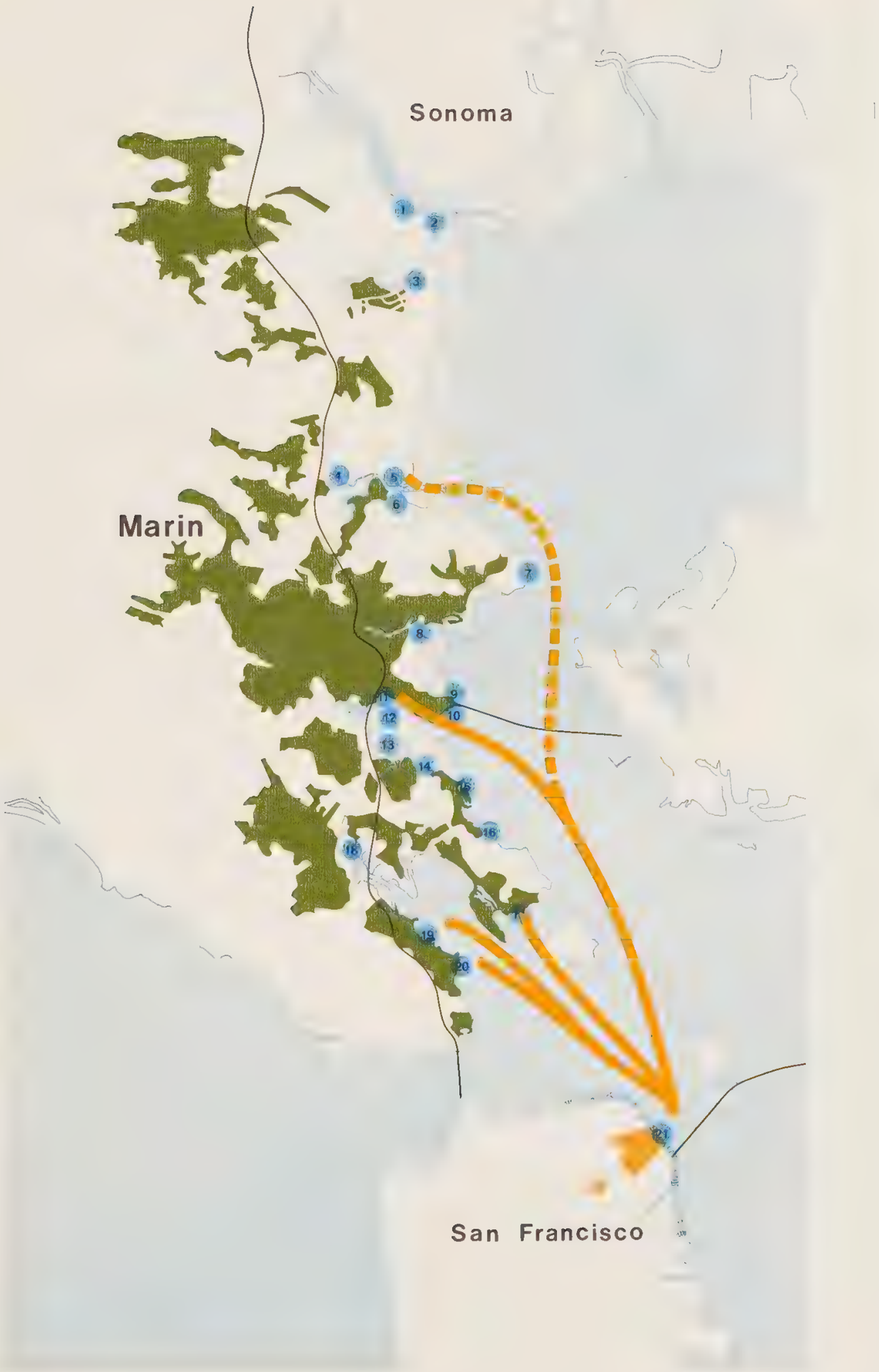
The Golden Gate Commuter Ferryboat System will be a component of the total transportation system serving the Golden Gate Corridor. The total system includes the proposed Marin County Rapid Transit System and other public transport, the street and highway system, as well as privately owned automobiles, each contributing to form a complex transportation system.

Every effort has been directed toward fitting the proposed Ferryboat System into the total system. The scope of this study, however, is limited to the water/land interface at each terminal. The terminal design beyond this is to be treated by others. Nonetheless, all possible factors affecting the total design of each terminal have been duly considered in this study.

Twenty-one terminal sites were impartially evaluated against a rigid selection criteria. First consideration was given to the regional and community goals established by:

Golden Gate Bridge, Highway and Transportation District
Bay Area Conservation and Development Commission
Bay Area Transportation Study Commission
San Francisco Planning Department
Port of San Francisco
San Francisco Chamber of Commerce
Marin County Planning Department
Marin County Balanced Transportation Program
Marin County Transit District
Marin County Flood Control
U. S. Corp of Army Engineers
City of San Rafael
City of Larkspur
City of Corte Madera
City of Tiburon
City of Sausalito

For each available site, consideration was given to its present and potential development, physical characteristics, and accessability to passenger origins and destinations. Physical characteristics included: terrain; surface and subsurface structure, age, compactness, stability, drainage, elevations, and weight bearing capabilities; usable area, relative construction costs, and accessability to utility and other services. Present and potential passenger accessability to and from site candidates via existing and proposed land transport, relative costs of improvements, and potential intermodal integration were vital considerations. Available space for parking lots, private automobile "pick up" and "drop off" locations, terminal and ancilliary buildings, and joint operation with other public modes of transportation were considered. The foregoing was weighed against the water distance to San Francisco, the proximity of the site to deep water, the amount and cost of necessary dredging and spoil disposal, climatic conditions affecting ferryboat operations, existing and potential waterway traffic, and potential joint sponsorship of waterway, harbor and terminal improvements.



Terminal Site Candidates

1. Petaluma River at Highway 37 crossing
2. Black Point
3. Bel Marin Keys
4. North Branch of Gallinas Creek at railroad crossing
5. Gallinas Creek, mouth, north bank
6. Gallinas Creek mouth, south bank
7. McNear's Beach
8. San Rafael Creek mouth, south bank
9. Marin Rod & Gun Club
10. San Quentin
11. Hutchinson Co., Corte Madera Creek, north bank, Larkspur
12. Heerdt property, Corte Madera Creek, south bank, Corte Madera
13. Muzzi property, San Clemente Creek, north Bank
14 San Clemente Creek, south bank
15. Paradise Cay
16. Paradise Beach County Park
17. Tiburon Harbor
18. Mill Valley Harbor
19. Marinship property, north Sausalito
20. Sausalito Point
21. San Francisco Ferry Building

Routes On Overlay	Nautical Miles
Gallinas Creek	16.5
Corte Madera Creek	11.25
Tiburon	5.6
North Sausalito	6.75
South Sausalito	5.5

North Marin

Gallinas Creek:

Of all the prospective ferryboat terminals sites examined north of San Pedro Point, Site 5 located at the mouth of Gallinas Creek, on the north bank, showed the greatest potential for serving the Northern Marin, Sonoma and Napa commuter market. Title of this property rests in the name of Jordon K. Smith et. al. The site is situated behind levees and appears to fit within the stated policies of The Bay Conservation and Development Commission. BCDC has designated this particular site as a waterfront park and has indicated that a ferry would be desirable.

The market area to be served through this terminal may in time generate more commuter passengers for the ferry system than the other market areas combined. The Marin County Planning Department population forecasts bear this out. Syphoning these commuters away from Route 101 above the congested areas in and around San Rafael would do much to relieve pressures on this route further south.

The site is located in a relatively undeveloped area where space is available for adequate parking lots and other potential terminal developments. BCDC has suggested that a major recreational park be created on the undeveloped land lying between the proposed terminal site and Hamilton Air Force Base. If created, this park would attract significant numbers of passengers for the ferryboat system during off-peak and weekend periods. The park and ferryboat system would collectively provide greater benefits for the residents of the Bay Area than either could accomplish individually.

In its present state of development, the Gallinas Creek site has no ready land access to the mainstream of traffic. Smith Ranch Road leading from the Lucas Valley Road-Route 101 interchange would require improvement and elongation to serve the site. An overpass might be required at the Northwestern Pacific Railroad right-of-way, the location for a possible joint terminal served by rapid transit as well as ferry terminal. The 1966 *General Plan for the City of San Rafael, Revised*, included recommendations for the improvement of Smith Ranch Road as a part of its "Major Proposal for a Shoreline Parkway". More specifically, the policy states, "Should any form of water-borne transit ultimately serve the Planning Area, the Shoreline Parkway will become a vital link in delivering traffic so generated to its destination." On December 12, 1969, the City of San Rafael formally annexed the area lying between Route 101 and the terminal site.

The Gallinas Creek terminal site is sixteen and one half nautical miles via water from the San Francisco terminal and approximately one and three-quarters land miles east of the Lucas Valley Road-Route 101 interchange. The highway distance from the interchange to the San Francisco Ferry Building is approximately 22 statute miles. To divert commuters from the highway stream, the ferryboat transit time must at least approximate the bus-highway time. Conventional ferryboats cannot provide service fast enough to meet this requirement, therefore, recommended service through the Gallinas terminal will employ high-speed advanced type craft.

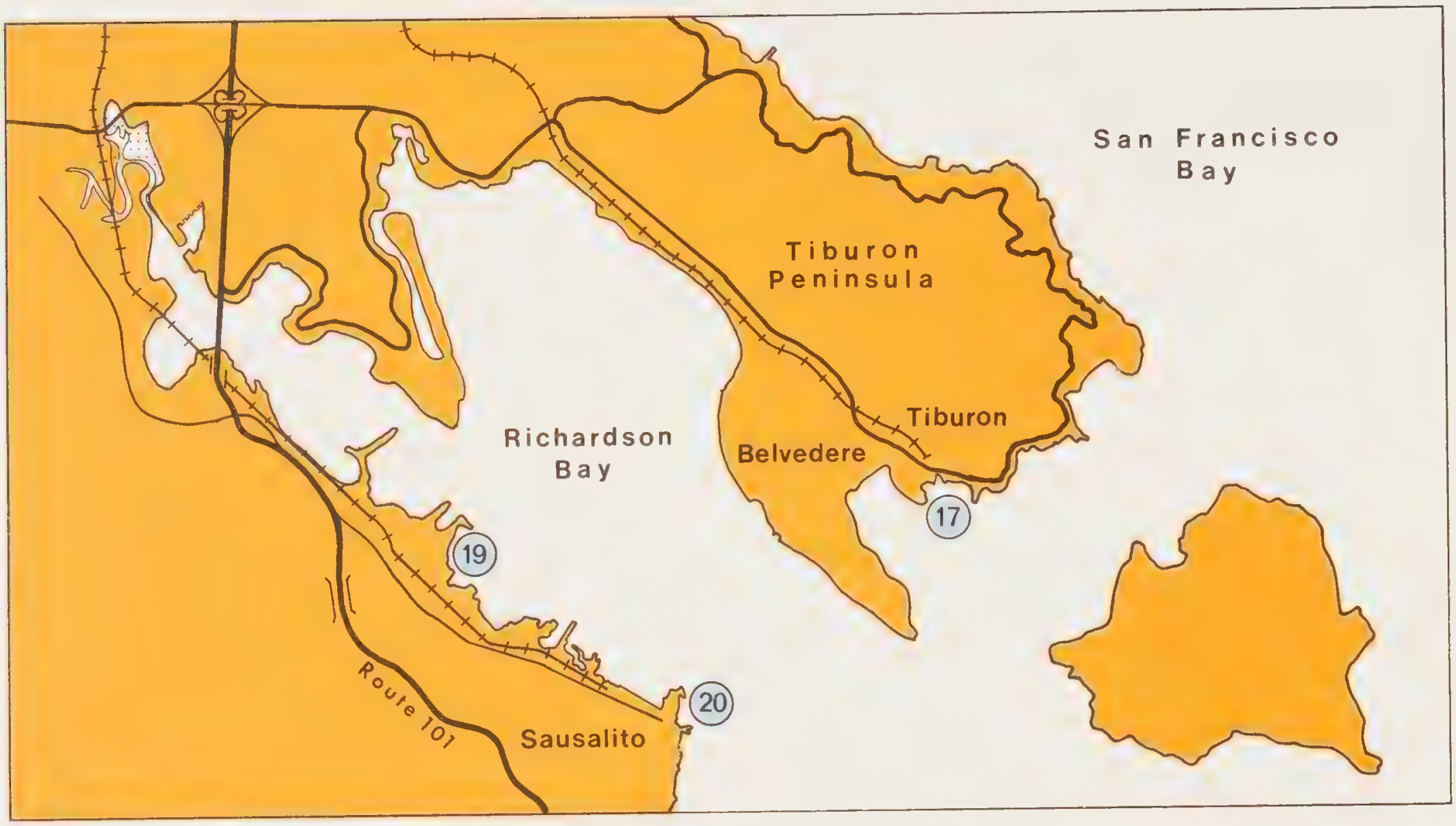
Central Marin

Corte Madera Creek:

Corte Madera Creek provides the best location for a ferryboat terminal to serve the Central Marin market. If for any reason development of the Gallinas Creek terminal is delayed, the Corte Madera Creek terminal could serve the Northern market as well.

The Corte Madera Creek location provides an unique opportunity to develop a major transportation center, for at this location major highway arteries come to a juncture with the Northwestern Pacific Railroad and the Creek. A terminal could be developed at this location to serve all modes of transportation. Administrative and servicing headquarters for the Ferryboat System and the proposed Marin County Rapid Transit System could be located here. Simultaneously, it provides the opportunity to develop a hotel, convention, shopping and recreation center to complement the transportation center. This center could generate valuable ferryboat traffic during off-peak and weekend periods.

Two terminal development sites are available at the Corte Madera Creek location. The dredging cost and ferry terminal facility requirements for both sites are equal. One site, No. 11, is located on the north bank of the creek in Larkspur and the other, No. 12, is on the south bank in Corte Madera. The Larkspur site is known as the Hutchinson Property and the Corte Madera site as the Heerdt property. Both communities are interested in having the terminal developed within their respective boundaries and each has sought professional assistance in planning. Although the Larkspur site appears to have some advantage over the Corte Madera site, the final decision might ultimately be based upon the merits of the development plans proposed for each site.



South Marin

Ferryboat terminal sites have been selected in both Sausalito and Tiburon to serve the Southern Marin ferryboat user market. This selection was based primarily on: the unique shape and geography of this market, the layout of the present and proposed commuter arterials, the state of development of the communities comprising this market, and community zoning and development plans.

Based on the above, two sites were initially selected in Sausalito: the Marinship Property in North Sausalito No. 19 and Sausalito Point No. 20 in South Sausalito. One site was selected in Tiburon, Tiburon Harbor No. 17.

Tiburon:

The Tiburon site lies southeast and adjacent to the present ferry terminal (Harbor Carriers) in Tiburon Harbor. This site was selected to serve the Tiburon peninsular section of the Soutern Marin market. Although secondary to the North Sausalito terminal development, this terminal would have limited parking available for ferryboat users.

This selection is consistent with the development plans of both the City of Tiburon and the Bay Area Conservation and Development Commission.

North Sausalito:

The site selected for North Sausalito is located in the Marinship Property area, adjacent to and just north of the U. S. Army Engineers waterfront installation. Of the three Southern Marine terminals, this will be the largest and most important, for it will service a larger portion of the commuter market.

The North Sausalito site is located approximately one nautical mile above the entrance channel to Sausalito Harbor and the route passes many yacht moorings. Vessels passing

within 500' of these moorings are required to proceed at a reduced speed. This reduced harbor speed to the North Sausalito terminal site could cause the ferryboat schedule to and from this terminal to become less attractive.

Two alternatives to this reduced speed condition were investigated. Provided the ferryboat design ultimately selected does not throw a heavy wake, a reasonable speed might be permissible if the existing channel were widened on its eastern edge. If this alternative proved impractical, then a high speed channel across Richardson Bay was suggested. It was rejected because of cost. The North Sausalito site suffers another disadvantage in the form of boat traffic in the harbor on weekends. This is especially true during the sailing season. This site selection is consistent with the development plans of both the City of Sausalito, Bay Area Conservation and Development Commission and the Marin County Planning Department.

South Sausalito:

The Sausalito Point site would be developed as a lesser terminal than that proposed for North Sausalito. The site selected lies southwest of and adjacent to the Trade Fair site (ferryboat Berkeley and slip). This site was selected to serve walk-on passengers going to and from Sausalito's central district. This selection has been conditionally approved by the City of Sausalito pending the outcome of the M. V. Golden Gate ferry service experience. It is believed that some protection from adverse weather conditions will be provided by the Trade Fair installation, but it is also possible that a breakwater may be required. Sounding data indicated that minor dredging would be required.

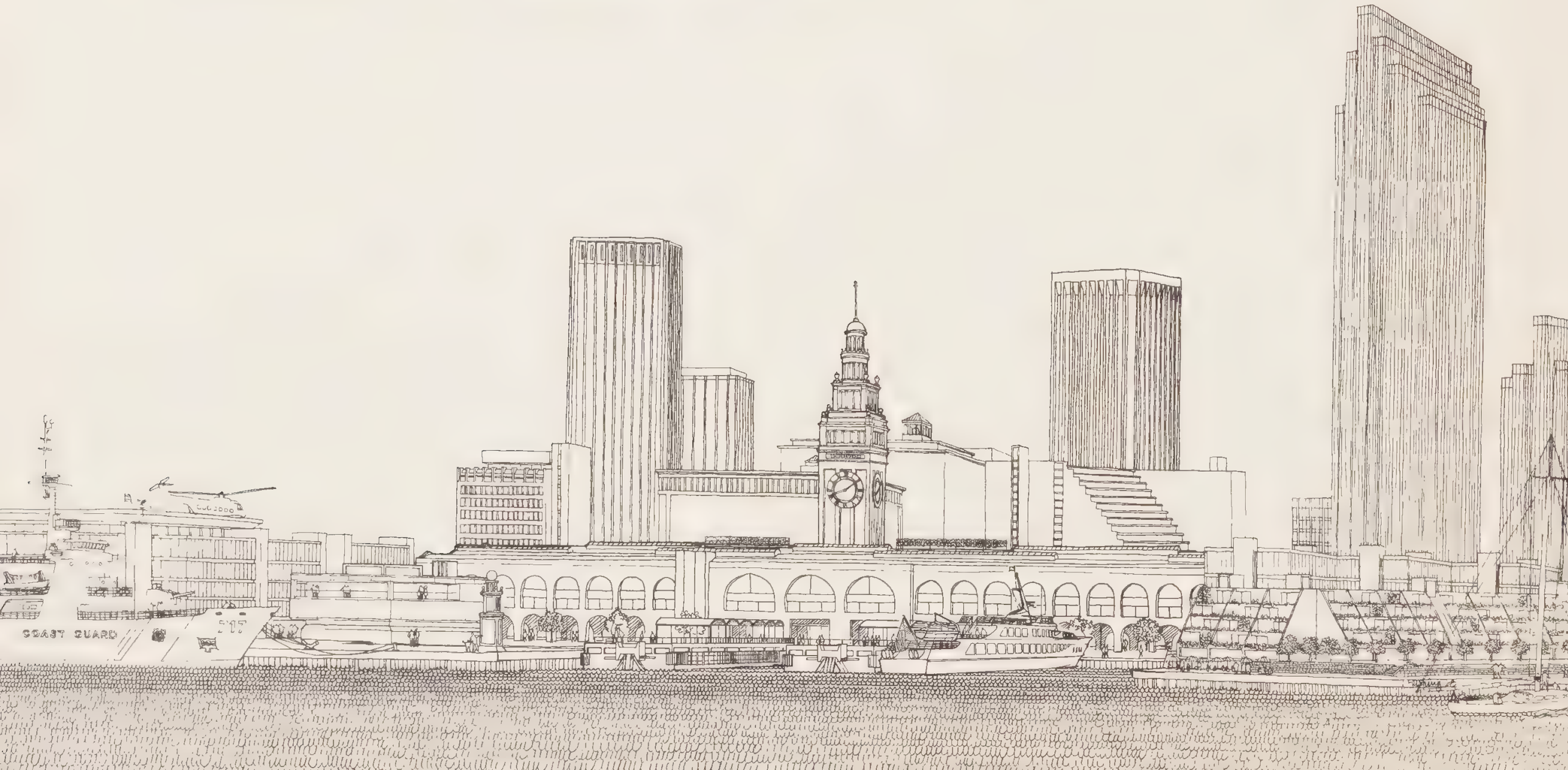
Both from an operation and economic point of view, it is extremely unfortunate that the Sausalito/Mill Valley ferry-boat market cannot be served through a single more centally located terminal in Sausalito. A terminal located mid-way between the proposed North Sausalito terminal and the Sausalito Point terminal would be far more practical in many ways than having to provide a less efficient service between two terminals. An in between terminal site would eliminate the costs and problems of operating mini-buses , for ferryboat passengers would be in easy walking distance of Sausalito's central business area. The resulting foot traffic would provide additional economic opportunities for the merchants lining Bridgeway Boulevard in the vicinity of the Post Office.

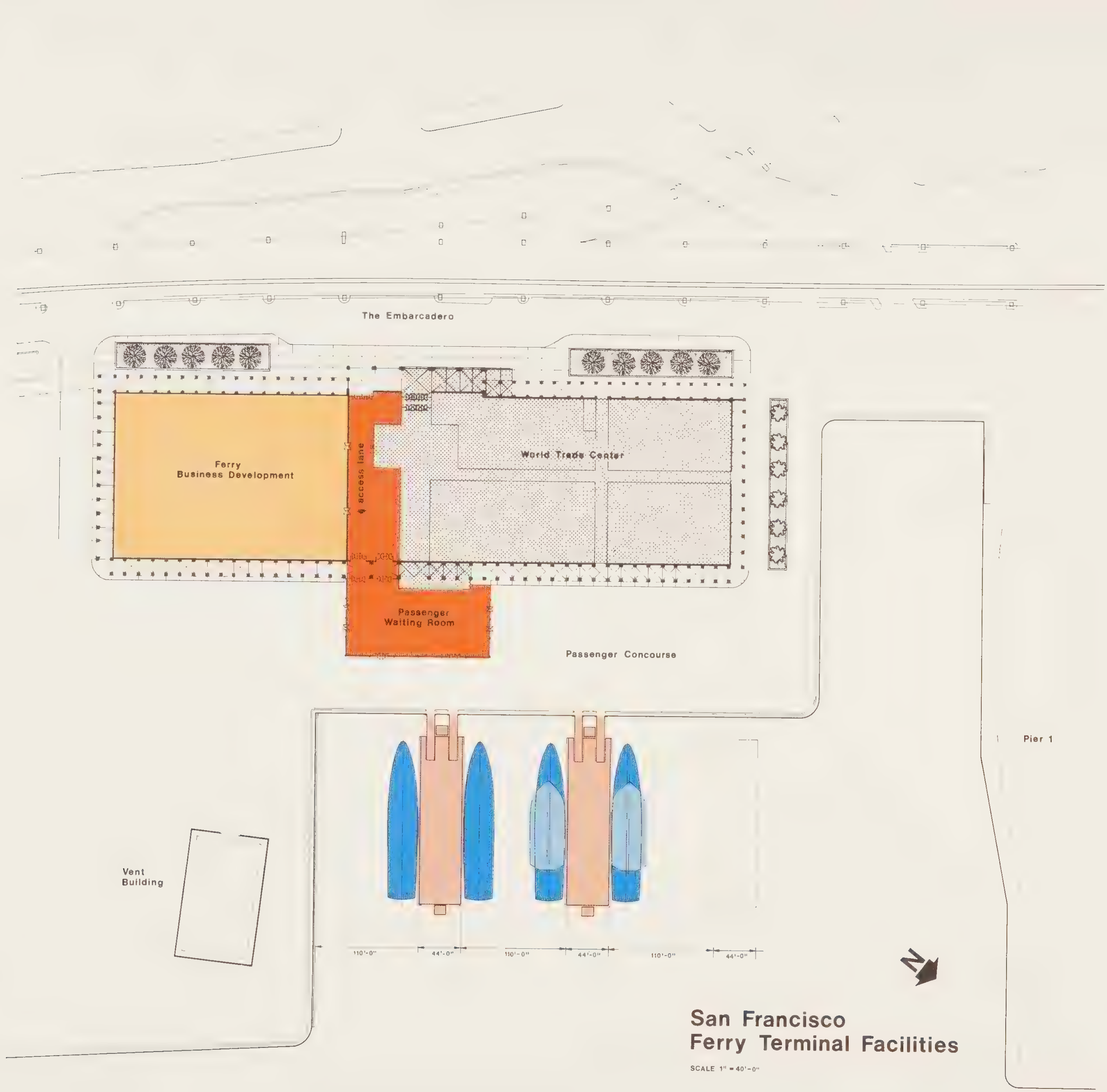
The single terminal would reduce ferryboat terminal cost in Sausalito more than half for the additional facilities required at Sausalito Point for protection against weather conditions from the southeast would no longer be needed. Terminal personnel and landing facility requirements would be reduced exactly one half and better service could be provided to the area. The mid-way terminal would reduce the internal harbor distance for the ferryboat, which would increase the safety of operations and reduce harbor traffic. The ferryboats would encounter less harbor traffic and could make better speeds and schedules. It is hoped that before the full ferryboat system is put into operation that a more desirable single ferry-boat terminal site can be found in Sausalito that would also satisfy the goals of Sausalito's long range planning.

San Francisco

The San Francisco Ferry Building provides an excellent selection as the southern terminus for the Golden Gate Ferryboat System. As it did in the past, the Ferry Building provides an unexcelled gateway to and from the San Francisco Central Business District, where the largest percentage of Marin commuters are employed.

Selection of the San Francisco Ferry Building has been endorsed by the Golden Gate Bridge District, Bay Area Conservation & Development Commission, The Mayor of San Francisco, San Francisco Planning Department, Port of San Francisco, San Francisco Chamber of Commerce and others. The Port of San Francisco has been most cooperative in the planning of the terminal facilities necessary at the Ferry Building.





San Francisco
Ferry Terminal Facilities

SCALE 1" = 40'-0"

Phillip F Spaulding And Associates Inc

San Francisco Ferry Building

Shown is the proposed layout of the docking facilities at the Ferry Building. The climatic conditions at this site are the most severe of any of the terminals. With winds from the southeast causing five foot waves and the possibility of a four knot current, it was found that the anchorage of the boarding floats would be quite difficult and costly. Therefore a breakwater is provided along the southeast side of the terminal area. This breakwater would also permit easier berthing of the vessels in stormy weather. Two boarding floats accommodate four vessels. A third float can be added later when the service demands. Available soundings indicate that a small amount of dredging will be required.

Terminal Facilities

Minimum loading and unloading time with rapid turn-around is the prime objective in our plan for developing terminals for the Golden Gate Commuter Ferryboat System. Passengers will walk on and off the vessels. Landing floats load on the upper and lower deck levels so that the interface between the vessel and landing float will always be the same without regard to tidal variations.

In anticipation of servicing the vessels, a service float will provide fueling facilities, fresh water facilities and sewage disposal for rapid servicing of the vessels. A vehicle ramp has been provided to permit delivery trucks, repair equipment, mobile cranes, etc., to drive directly to the ship's side. The service float will provide overnight berthing for two vessels. Swan & Wooster Engineering, Inc., has been retained as part of the study team to assist in the development of the terminal facilities and dredging problems.

Boarding Floats

The basic float is proposed to be 44' by 175' and manufactured of ferro cement. A typical cross section of ferro cement consists of a series of small diameter bars uniformly spaced. These are sandwiched between layers of wire mesh. From 4 to 16 layers have been used. These layers of mesh are tied tightly to the bars to form a compact layer of highly subdivided reinforcement. This is embedded in cement mortar with about a 1/8 inch cover over the outermost layer of mesh. Thus the total thickness will be at least 1½ inches. Mesh may be in the form of screen wire with square openings of various sizes; chicken wire with ½ inch, ¾ inch, or 1 inch openings, or expanded metal lath. Mortar is made with about a 1 to 2 mix and with a water-cement ratio of about 0.35. A good grade of sand with no material larger than about 1/8 inch is usually used.

Of particular interest is the fact that ferro cement hulls are virtually maintenance free. Marine borers have no effect. Hulls will not rot. They are fireproof. There are no seams to calk or to leak. The surface will take a good paint coat but painting is for appearance only and is not needed for protection. The strength of the mortar actually increases with age. Resistance to shock and abrasion is excellent. Severe impact may cause local damage but seldom if ever has it penetrated a ferro cement hull. Local damage, usually in the form of fine cracking, has occurred in several boats involved in collisions or running aground. Leakage is easily controlled and readily repaired.

The hull would be divided into watertight compartments with precast waffle type bulkheads forming cubical cells of equal dimensions, about 8 feet. Intermediate ribs and joists can be formed into the hull for additional support for the shell.

A minimum of five foot freeboard is desirable for wave action and to accommodate the rub strake on the vessel. To protect the float from the rub strake it is planned to install vertical timbers of greenheart or eucalyptus wood at about five foot centers from the water line to the deck on both sides of the float.

The berthing forces will be transferred from the float through A frames at either end of the floats into rigid type mooring dolphins. To absorb the energy of the berthing forces, rubber fenders similar to General Rubber Company's "Port Slides" will be used between the A frame and the dolphins. The dolphins are designed to resist all stresses imposed on the floats from wind, waves and berthing.

Inasmuch as it is planned to embark and disembark passengers from the upper deck of the vessel, it is necessary to add a second deck to the float to accommodate the ship's gangways. This second deck will be steel framed with a concrete deck. The sides and ends will be open with protective handrails. At the loading points a sliding section of handrail will be provided somewhat greater than the width of the gangways so that exact spotting of the ferry will not be required. This upper level will be roofed over with plastic skylights installed as required. Electric lighting will be provided for night operation. The loading ramps from the float to the bulkhead will be roofed and lighted like the upper deck.

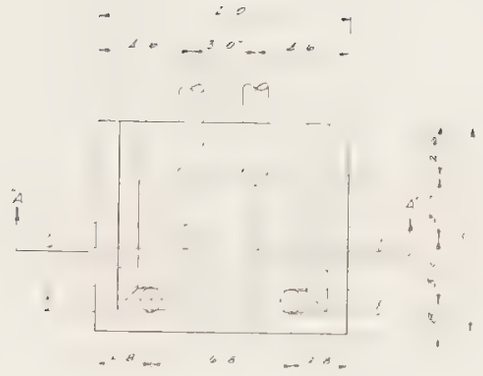
To facilitate rapid turn around of the ferry, it is planned to install hydraulic take-up cylinders on the float with quick release hooks to handle the spring lines. A permanent pendant line will be installed on the vessel. When berthing, the bight of the pendant line can be engaged in the hooks at both the forward and aft locations and the vessel quickly brought into position for lowering the gang planks. A similar system can also be used for the breasting lines.

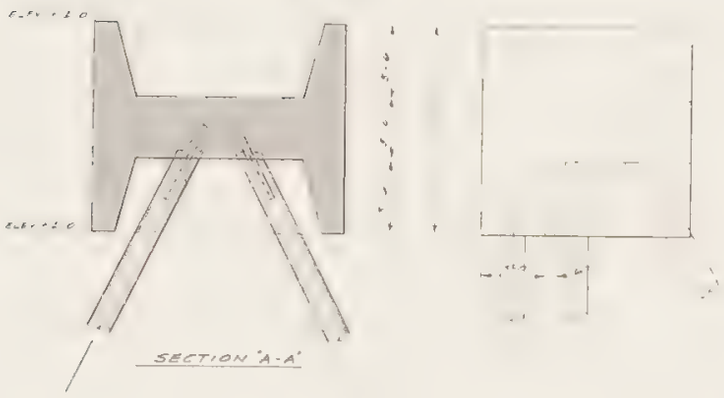
Service Float

Also shown is the service float for use at Corte Madera. The basic construction of this unit would be ferro cement as above with proper anchorage. However, no superstructure is planned for this float. Its dimensions will be 40' by 175'.

Dredging

The extent of dredging is shown. Due to character of the bay mud at these sites, it is necessary to use very flat side slopes on the channel to maintain proper depth.

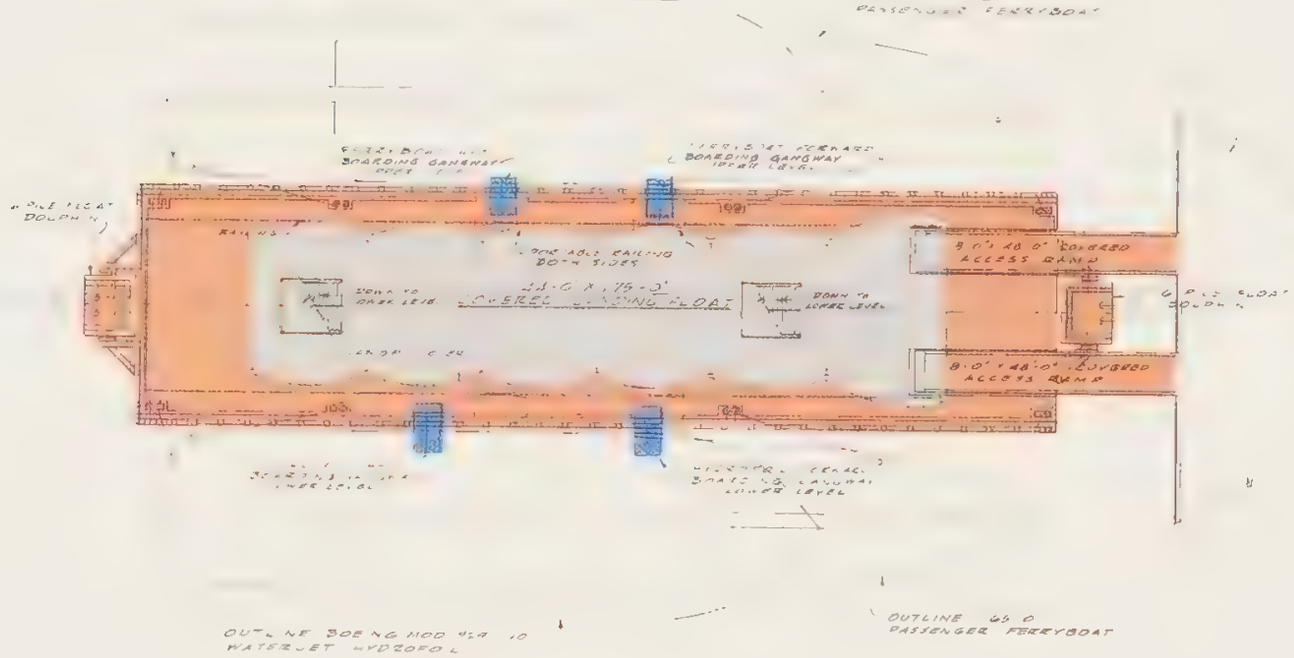




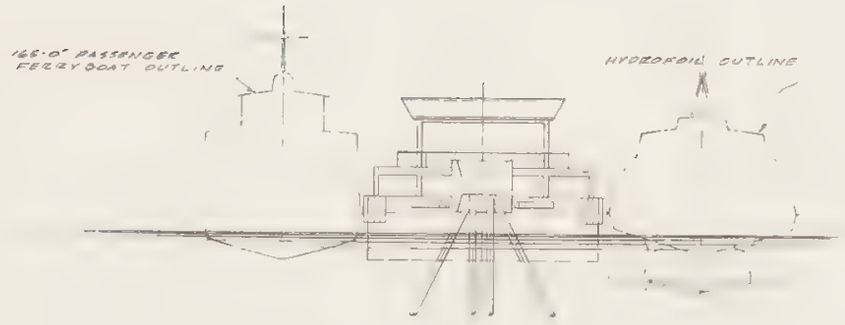
Typical Float Dolphin

Plan View of Service Float

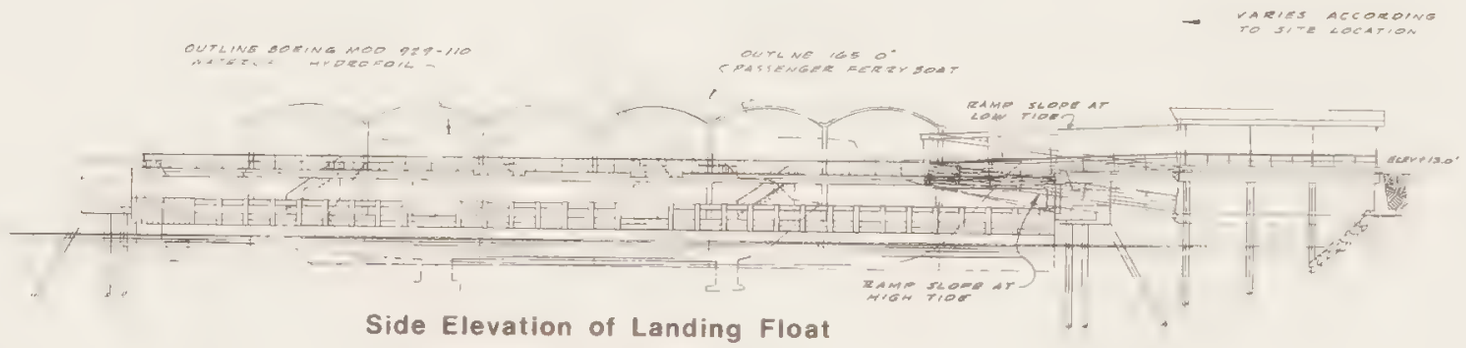
Side Elevation of Service Float



Plan View of Landing Float
SHOWING MOORING



Outboard End Elevation of Landing Float



Side Elevation of Landing Float

OUTLINE OF M.V. GOLDEN GATE NOT
SHOWN BUT WOULD USE LOWER LEVEL
FOR BOARDING PASSENGERS

Typical
Passenger Boarding Floats

SCALE 1/16" = 1'-0"

Recommendations for Terminal Development

Design of terminal buildings and facilities beyond the water interface will be undertaken by architects selected by the Bridge District. In order to gain the greatest effectiveness, it is hoped that all possible factors affecting the total design of the ferryboat system relate and that each terminal design should consider the overall goal of functionalism and beauty. We recommend the following design criteria:

1. The style of architecture should achieve a composition of spacial variety with vertical and horizontal use of spaces clearly defined inside and out.

2. Covered and open outdoor spaces should be well related and suited to the region's topography and environment. The various structures should be sensitively developed and lend character and interest to the vessels, ramps, floats and docks. The architect should select a major building material to achieve unity throughout the design of each terminal facility.

3. Consideration should be taken to all overall sense of scale, recognizing the board expanses of the Bay, distant mountain views and climate.

Pedestrian Circulation

1. Pedestrian separation from vehicular movement.

2. Space used as an open, informal atmosphere utilizing careful comparison of alternative paths of movement to favor the largest number of people.

3. A consistency should be used in all communication and directional signs using expressive language, applying nondisruptive visual sign installation.

Parking Facilities

1. In parking and feeder service areas there should be stringent structural, traffic and land use controls to protect either the existing, or promoting a rural, harbor and waterfront resources with consideration given to saving any historic landmarks.

2. Parking distributed on the perimeter at points of easy direct pedestrian access without infringing on the terminal building. This facilitates pleasant pedestrian space and foreground for commuter circulation prior to entering or leaving terminals and allows for future growth. We recommend informal parking areas with benches, planters and use of graphic illumination along walkways, parkways, etc.

3. Grade separation and/or recessed parking surfaces, designed with either earth berms or surrounding walls and heavy landscape treatment.

Clearly each terminal is a part of the total water transportation system. The goal of community and regional planning will be accomplished as each terminal facility becomes a focal point of attention and a symbol of San Francisco Bay spirit and pride.

Estimated Costs/Dredging and Floats

Galinas Creek

One large Boarding Float	$ 250,000.	
Dredging	1,540,000.	$1,790,000.

Corte Madera/Larkspur

Two Large Boarding Floats	$ 500,000.	
One Service Float	145,000.	
Dredging	1,260,000.	$1,905,000.

Central Sausalito

One Large Boarding Float	$ 250,000.	
Dredging	20,000.	$ 270,000.

Tiburon

One Large Boarding Float	$ 250,000.	
Dredging	20,000.	$ 270,000.

Ferry Building

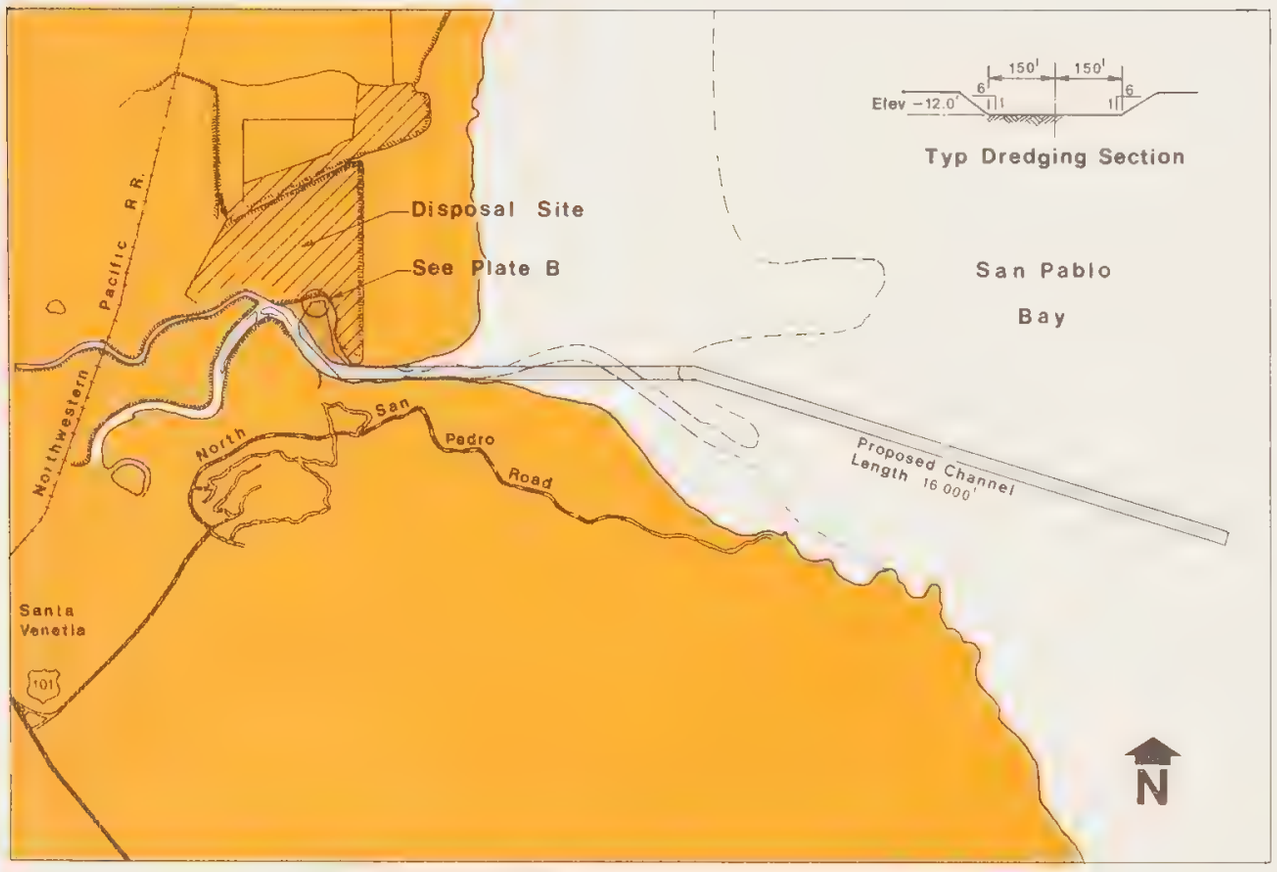
Two Large Boarding Floats	$ 500,000.	
Breakwater	76,000.	
Dredging	10,000.	$ 586,000.

Total $4,821,000.

Climatic Data at Terminals

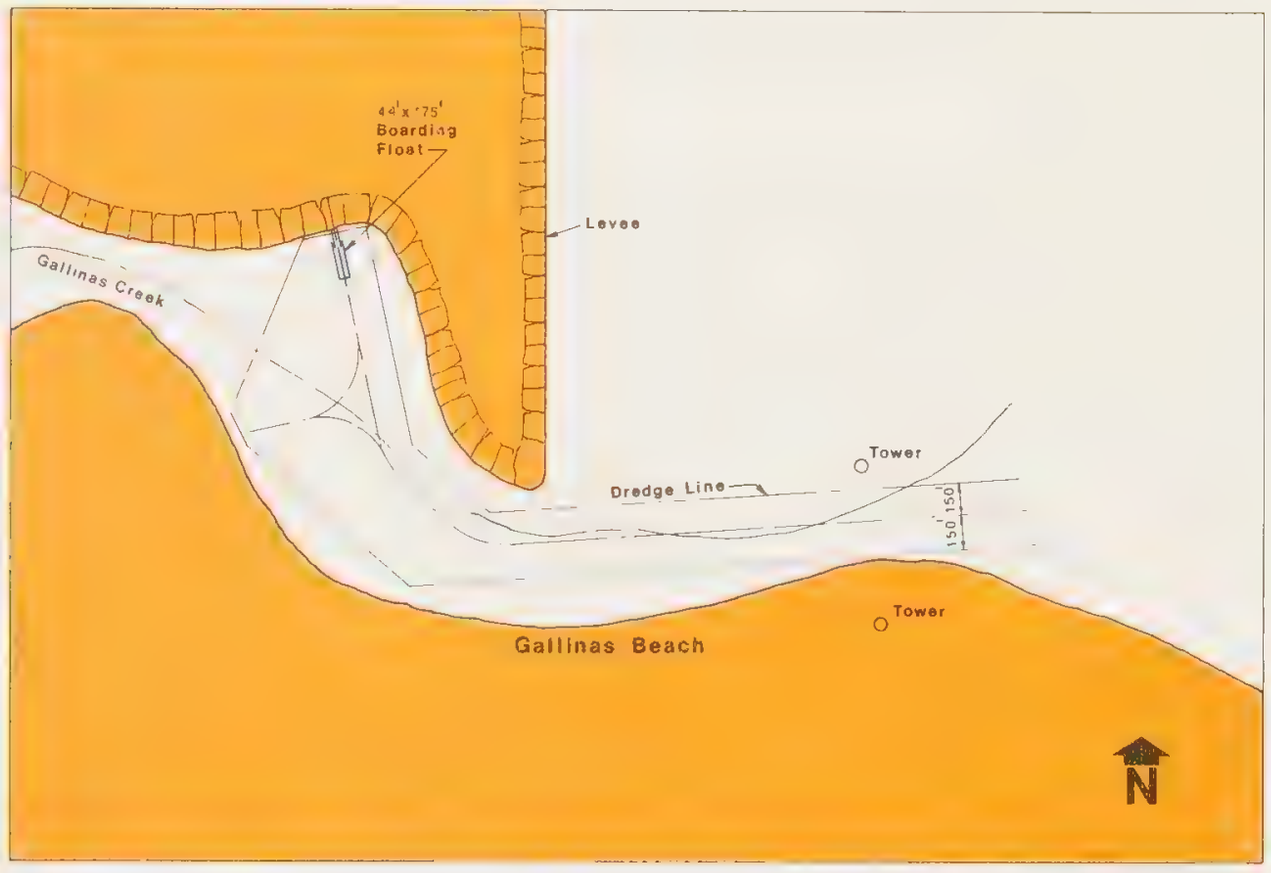
Location	Wave Height-Ft.	Wave Length-Ft.	Period-Sec.	Current Knots	Wind* M.P.H.	Major Direction
Ferry Building	5.0	65.0	3.5	4.0	40	N.-S.E.
South Sausalito	4.2	57.0	3.3	1.5	40	S.E.
North Sausalito	3.0	53.0	3.0	1.0	40	E.
Tiburon Terminal	3.0	53.0	3.2	1.5	40	S.
Tiburon Outside	3.8	53.0	3.2	3.6	40	S.
Corte Madera	—Insignificant—					
Galinas Creek	—Insignificant—					

*Wind velocity is maximum sustained
Short term winds to 55 M.P.H.



Channel Dredging

Plate -A



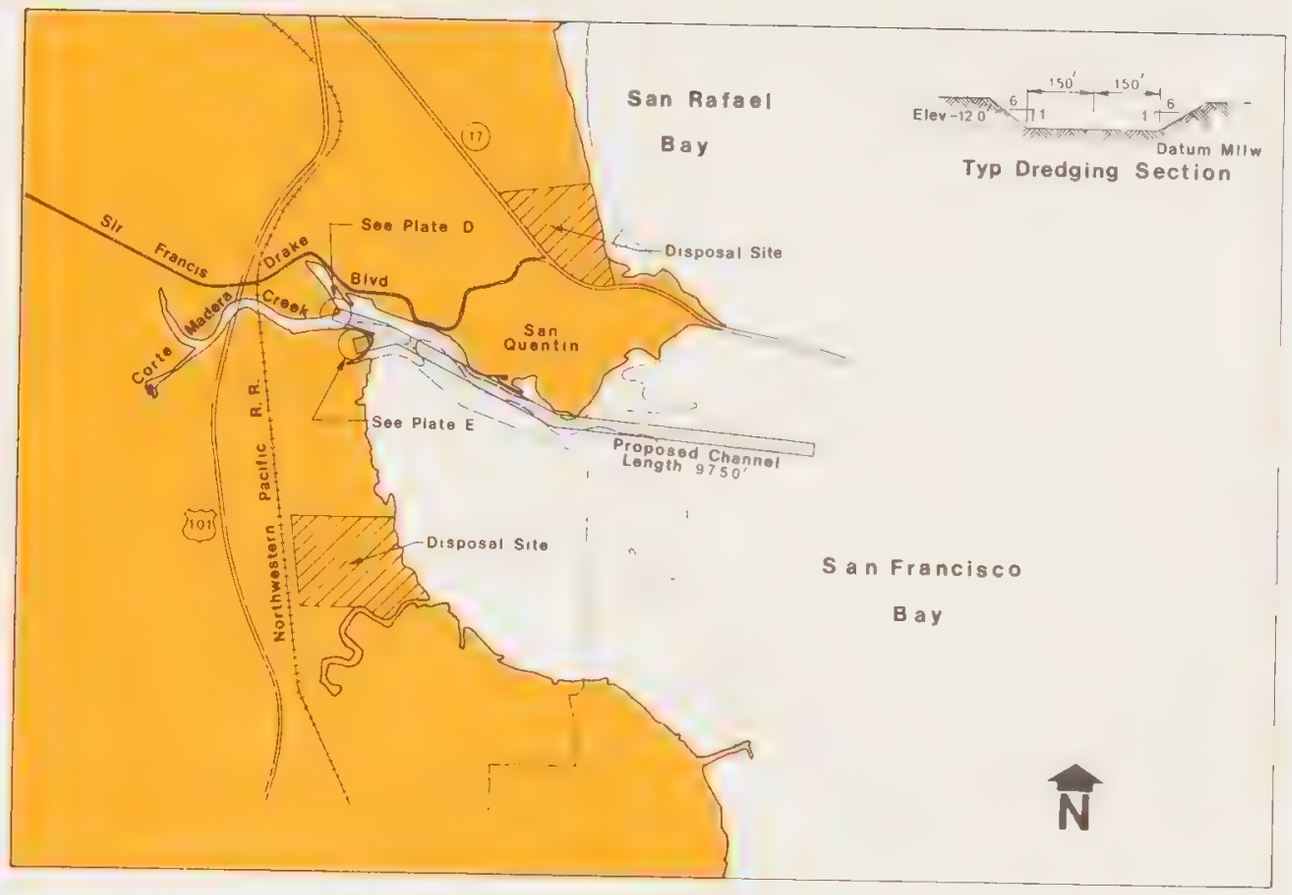
Float Plan

Plate - B

Terminal Boarding Floats and Dredging

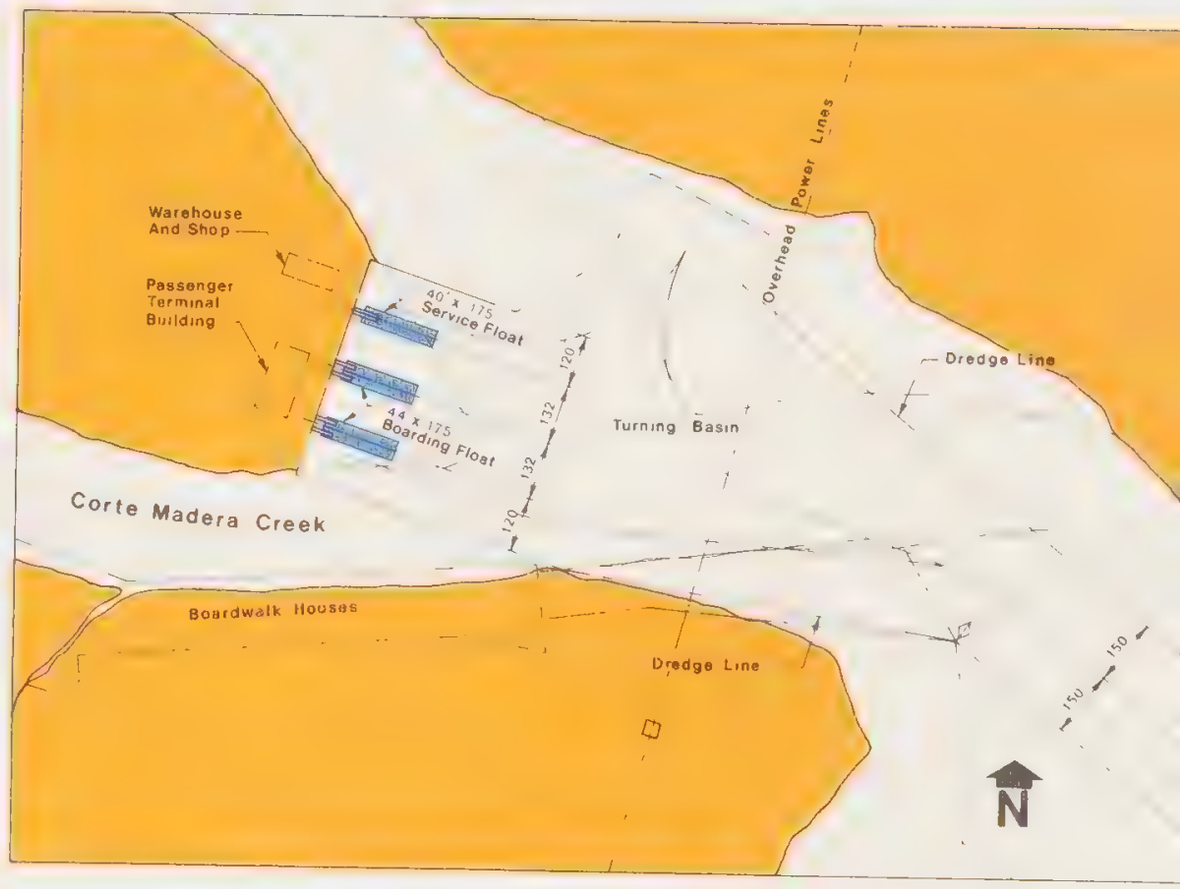
Gallinas Creek

The most northern terminal is located near the mouth of Galinas Creek. It is potentially the fastest growing area and in a few years will require advanced systems craft such as the Boeing Model 929-110 waterjet hydrofoil in order to meet the transit time demand. With this in mind, the large sized boarding float is planned at this location. The mud flat at this site extends a considerable distance into the bay, requiring considerable dredging to reach navigable water. Diked areas in the vicinity are available for disposal of the dredged material.



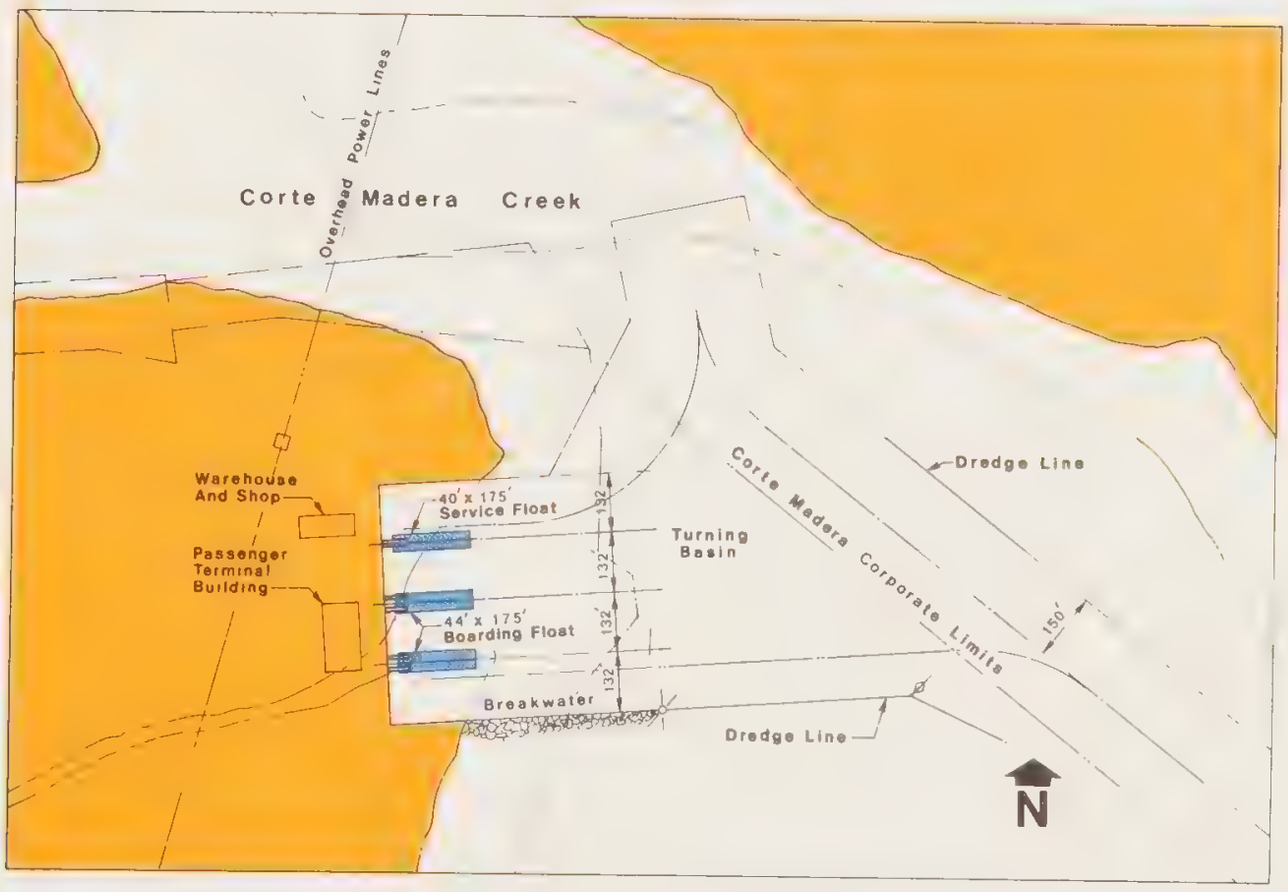
Channel Dredging

Plate - C



Larkspur Float Plan

Plate - D



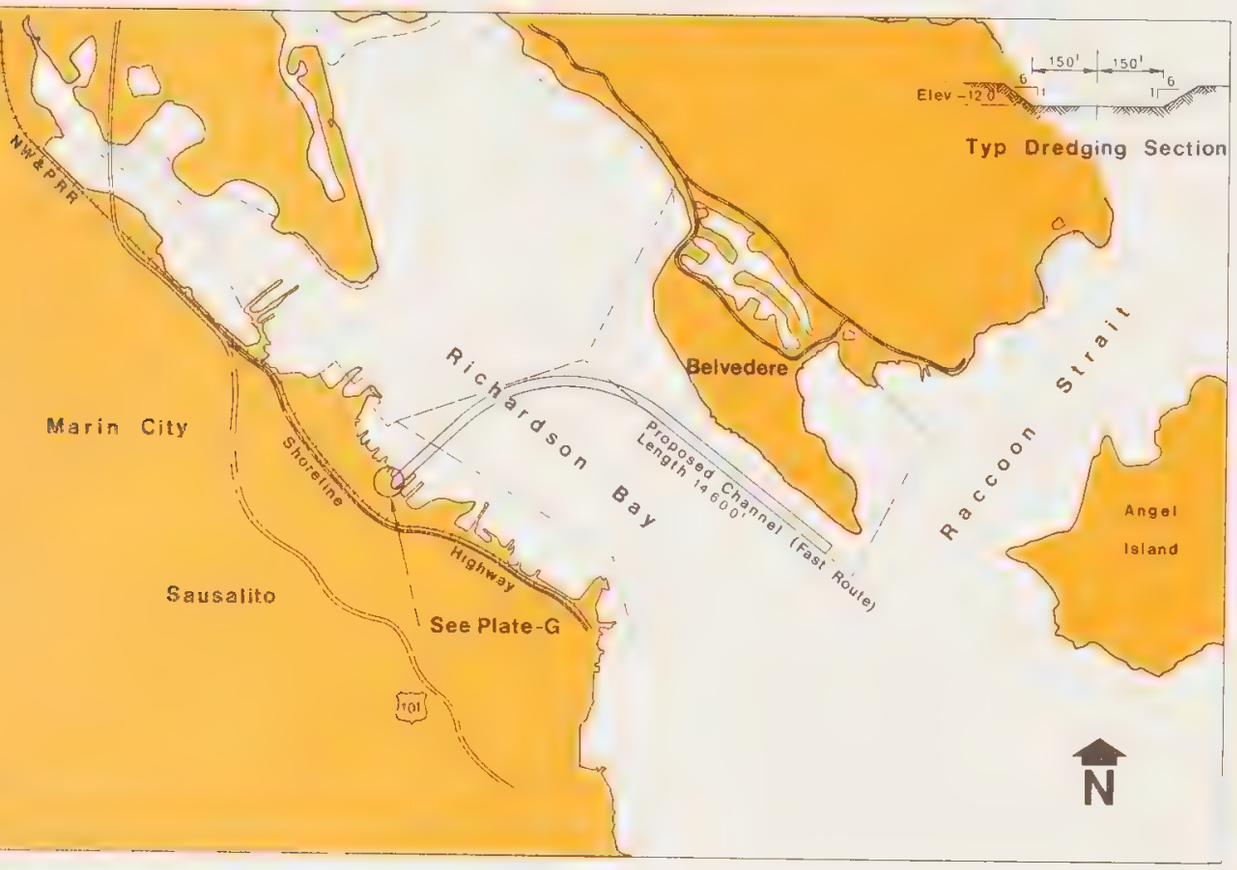
Corte Madera Float Plan

Plate - E

Corte Madera Creek

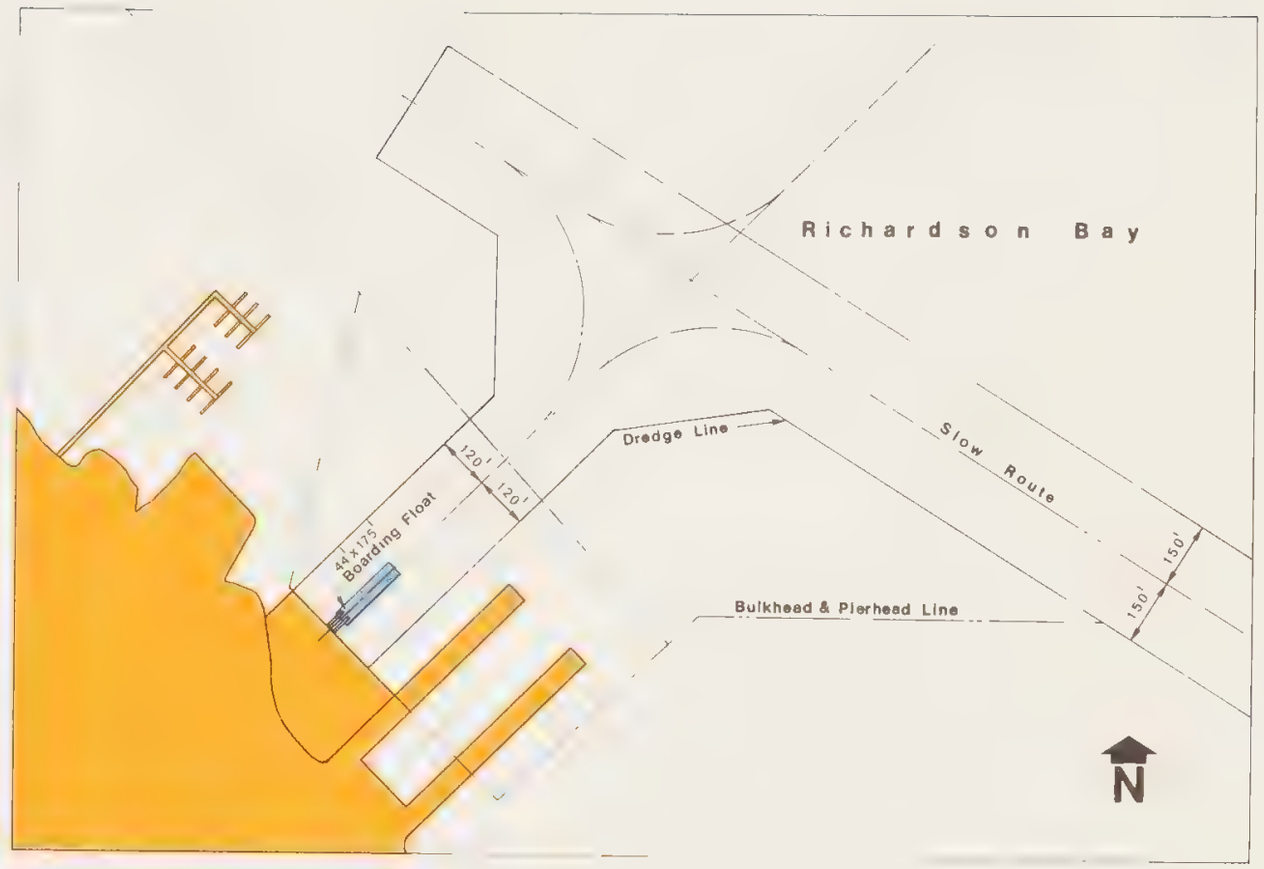
Corte Madera Creek has been selected as the main base of operations with repair and maintenance facilities provided. The terminal layout at the Corte Madera site comprises two large boarding floats plus a service float. These accommodations will provide standby berths for five vessels during periods when the ferries are not in service at night.

In order to place the ferry terminal near the land transportation facilities, it is necessary to dredge a channel from the terminal site to San Francisco Bay as shown. This dredged material can be deposited at two sites in the near vicinity. One site is located in a diked area designated for dredge spoils south of the terminal and the other site just north of Point San Quentin.



Channel Dredging

Plate - F

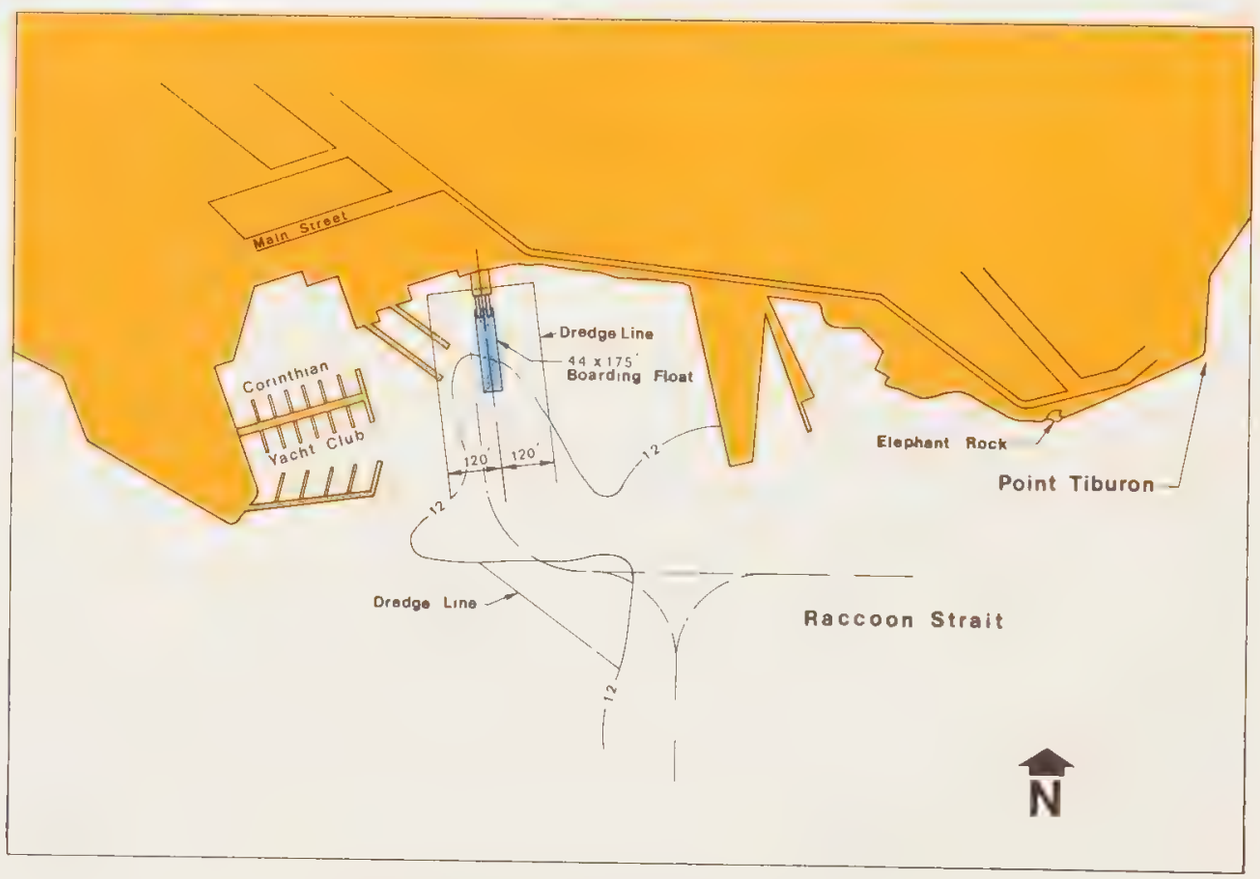


North Sausalito Float Plan

Plate - G

South Sausalito Float Plan

Plate - H



Tiburon Float Plan

Plate - I

North Sausalito

The terminal layout here is shown. From the North Sausalito site there exists a dredged channel to the San Francisco Bay parallel to the shoreline. This channel, however, runs close to many marinas and boat moorages necessitating reduced speed operation.

For high speed operation necessary to maintain a competitive schedule, it has been considered that a separate channel be dredged through Richardson Bay. The route takes advantage of the deepest part of the bay to reduce the amount of dredging. There appears to be no suitable spoils area in this vicinity to handle quantity of dredged material involved as it is planned to transport this material to sea for disposal. This proposed channel has been rejected because of cost. Instead the plan of widening the existing channel (shown) is suggested if a central Sausalito site is not located.

South Sausalito

Shown is a layout of the South Sausalito Terminal. This location is quite exposed to wind from the southeast resulting in the greatest wave exposure of any terminal except the Ferry Building site. The tidal current at this location is much less than the Ferry Building and it is felt that a breakwater would not be warranted initially. The dredging will be minimal at this site.

Tiburon

The terminal layout at this point of call is shown. It is anticipated that the vessels used here would be around 500 passenger capacity. However, during midday the 165 foot Corte Madera vessels will call at Tiburon during the Bay Circle cruise. Therefore a standard boarding float is planned at this site. This is also in keeping with the desires of the local residents. The climatic conditions are not as severe as at the Ferry Building, relieving the necessity of auxiliary protection. Also show the extent of dredging required. Spoils from the dredging required in Tiburon Harbor could be disposed of at the Alcatraz dumping area.

Vessel Candidates

The next step following the determination of the potential market for ferryboat service, the terminal site location, and selecting ferry routes was to study suitable vessel candidates which would provide optimum service. The fourteen vessel candidates studied are illustrated.

These vessels include a full range from conventional displacement vessels to sophisticated advance marine systems craft. Each was compared to a vessel selection criteria developed for San Francisco Bay service.

Vessel Selection Criteria:

Safety

Compliance with U. S. Coast Guard Regulations; related to passengers and crew; effect on other craft using the Bay.

Passenger Acceptance

Seating arrangement for comfort; window arrangement for sightseeing; open space for passenger circulation; appearance and decor; internal environmental control and lighting; services such as food, beverages, etc.; toilet facilities; quality of ride related to noise and vibration.

Operation

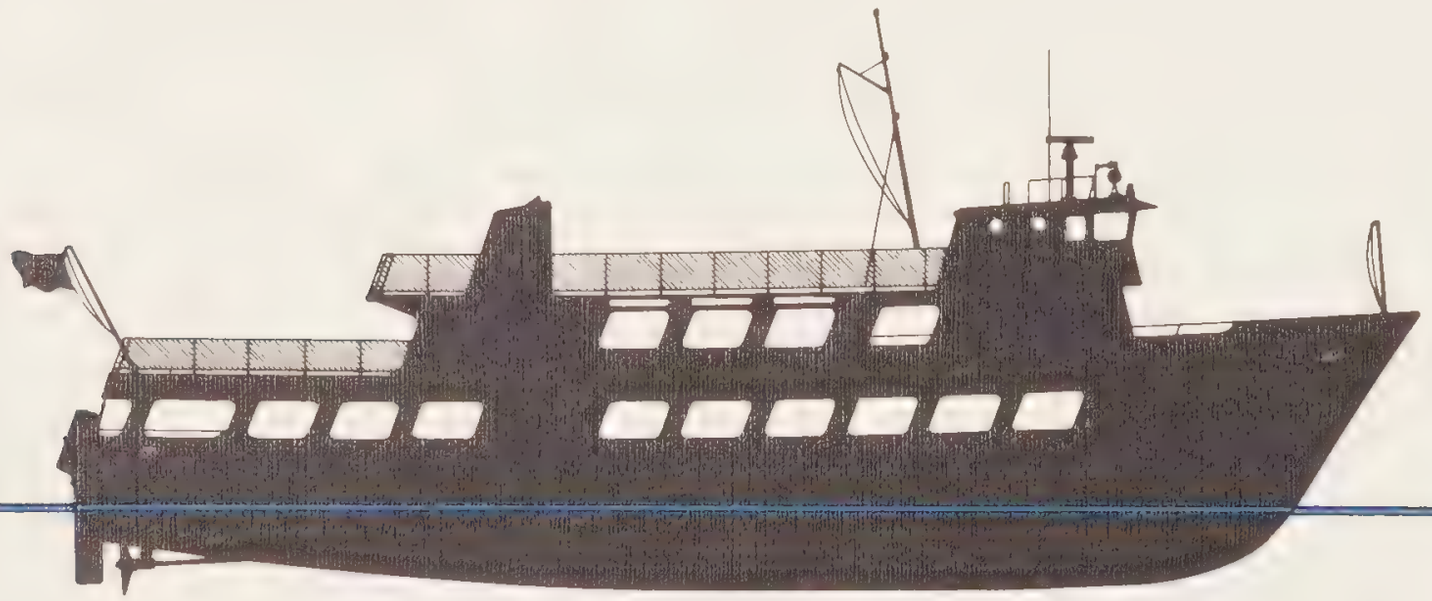
Crew requirements (and related union agreements); draft limitation; speed and maneuverability; terminal turnaround (embarking and disembarking passengers); interchangeability (for other routes and services); flexibility (for peak and off-peak service); economy of operation and maintenance; reliability and all weather operation; ease of servicing; state of the art and availability.

Economic Feasibility

Construction cost; operating cost; revenue generating potential. Due to the fact that ferryboat service in San Francisco Bay is declared "domestic trade", the purchase of foreign built vessels of any category is not permitted by federal legislation.

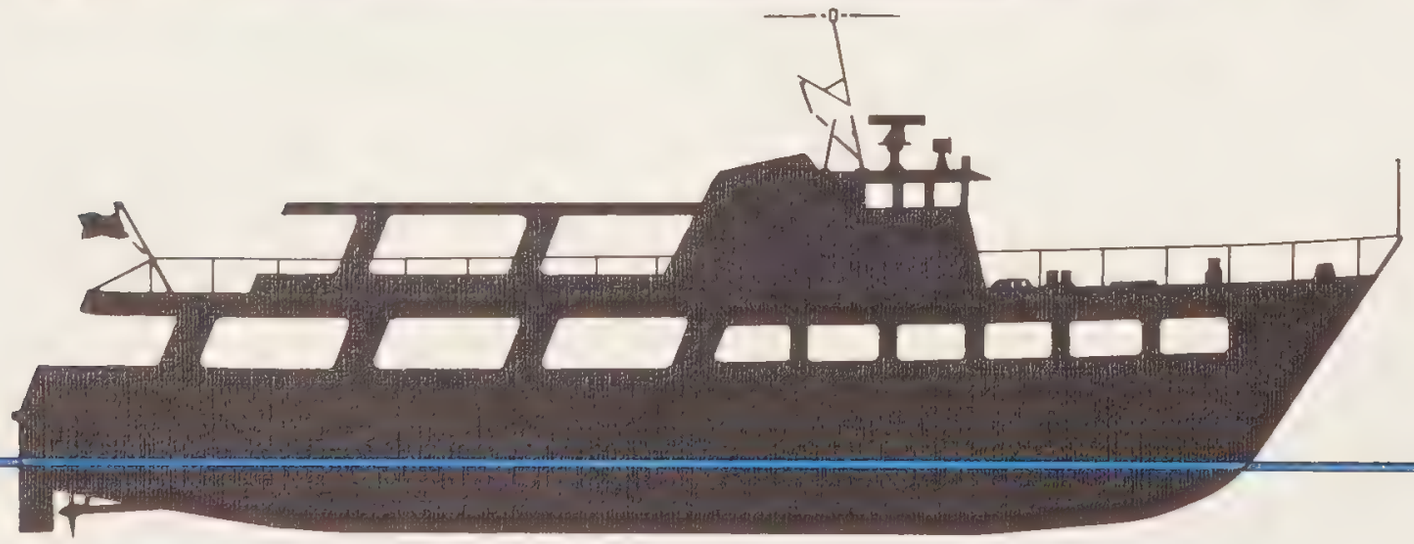
The vessel candidates best answering the foregoing criteria were then tested in various combinations within a mathematical model described under System Design in this study.

Steel Displacement Hull — Diesel Power



M.V. Golden Gate
San Diego Marine Const. Co.
L-113'7" B-30'8" Draft 7'5"
1100 S.H.P. Diesel Screws-2

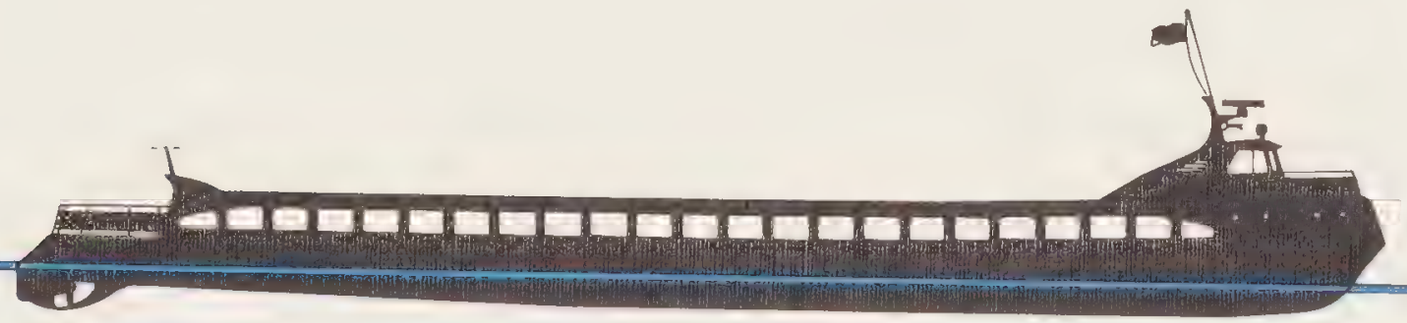
Sustained Sea Speed-15.0 knots
98 Gr. Tons; Pgrs. -582
$700,000



M.V. Hawaii State
Blount Marine Corporation
L-128' B-27' Draft 6'3"
1450 S.H.P. Diesel Screws-2

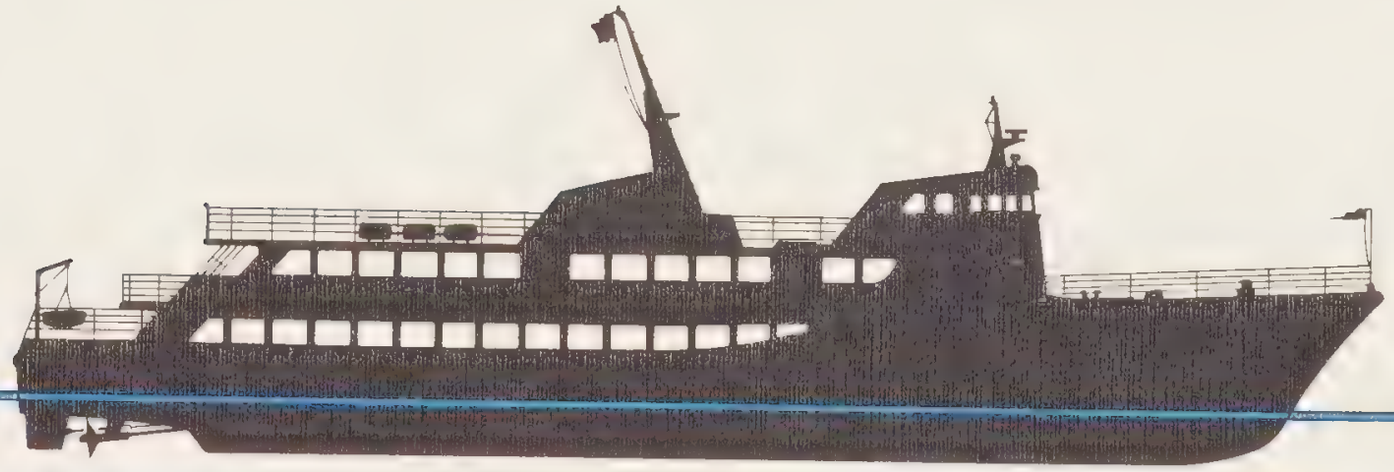
Sustained Sea Speed-16.0 knots
94 Gr. Tons; Pgrs.-500
$682,000 modified for S.F. Bay

High Speed Displacement Hull — Diesel Power



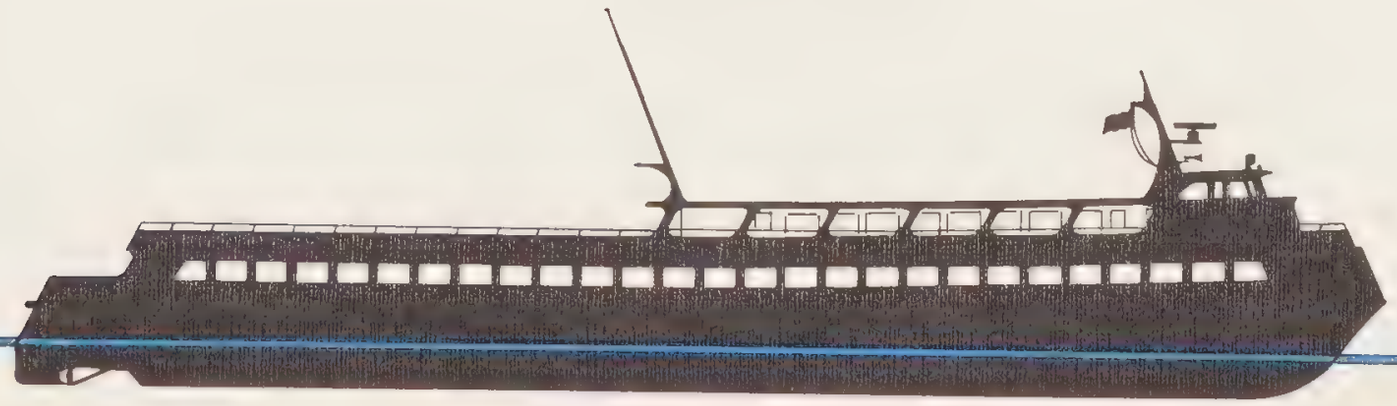
Blount 500
Blount Marine Corporation
L-160'6" B-28' Draft 4'6"
2540 S.H.P. Diesel Screws-4

Sustained Sea Speed-20 (21.5 max)
90 Gr. Tons; Pgrs.-500
$825,000 (quote +10%)



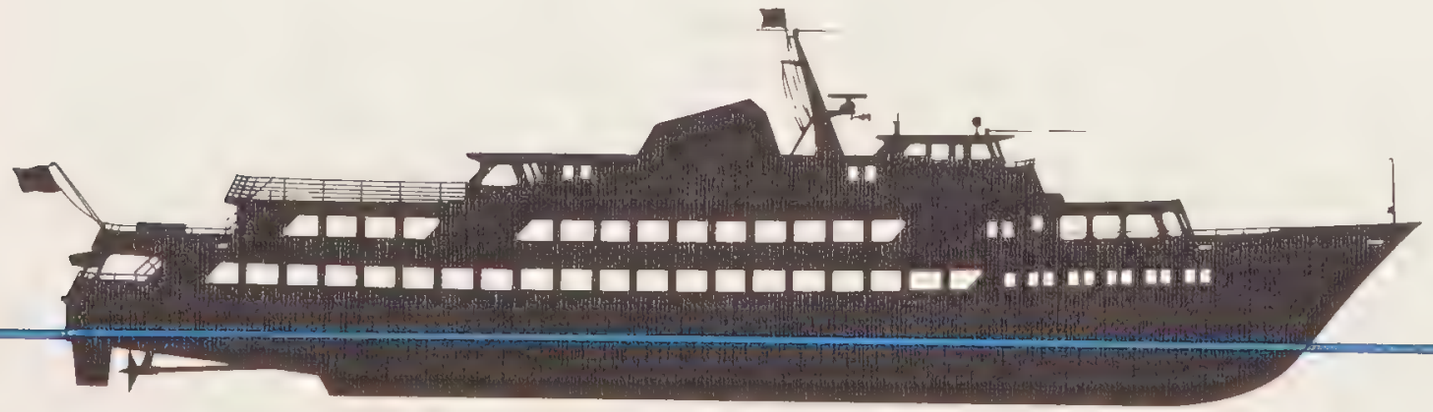
Halter 500
Halter Marine Service
L-162'6" B-29' Draft-6'
3900 S.H.P. Diesel Screws-3

Sustained Sea Speed-20 knots
99 Gr. Tons; Pgrs.-506
$1,650,000 (quote +10%)



Blount 624
Blount Marine Corporation
L-185' B-42' Draft 5'6"
2900 S.H.P. Diesel Screws-4

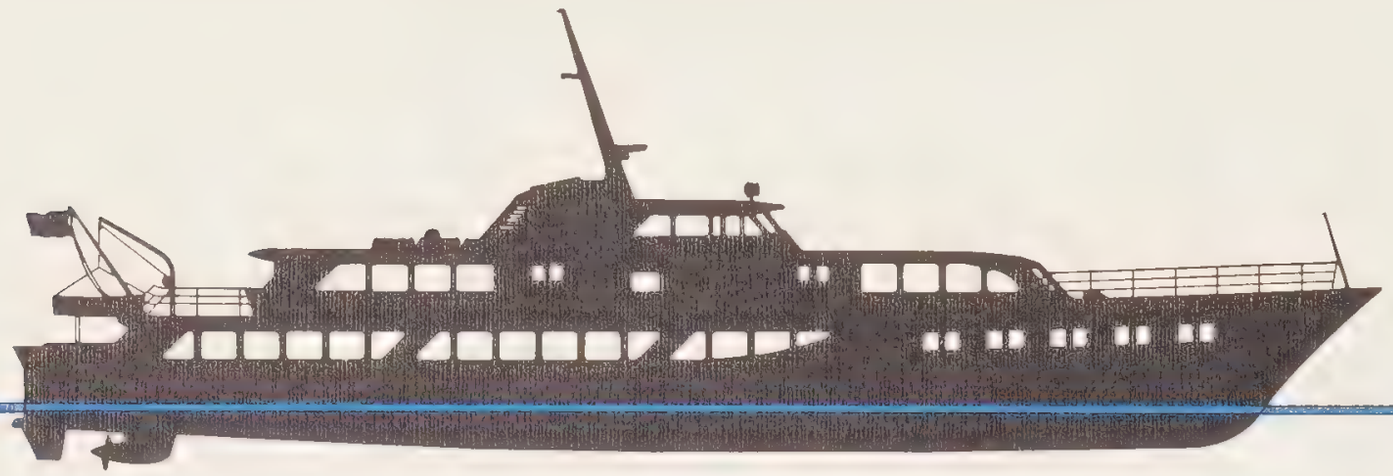
Sustained Sea Speed-20 (22 max)
100+ Gr. Tons; Pgrs.-624
$1,017,500 (quote +10%)



Spaulding 209
P.F. Spaulding & Assoc., Inc.
L-209'6" B-38' Draft-9'
5700 S.H.P. Diesel Screws-2

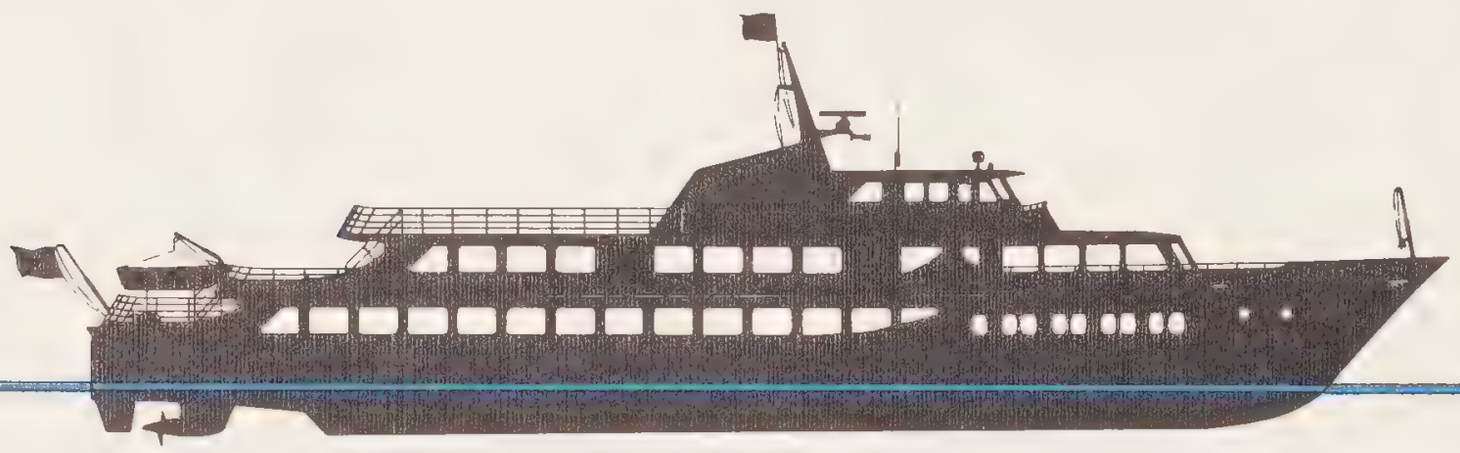
Sustained Sea Speed-20 knots
100+ Gr. Tons; Pgrs. -976
$2,650,000 (quote +10%)

High Speed Aluminum Displacement Hull — Gas Turbine



G.T. Avalon
Martinolich Shipbldg. Corp.
L-160'4" B-27'5" Draft 5'¼"
5000 S.H.P. Gas T.; Screws-2

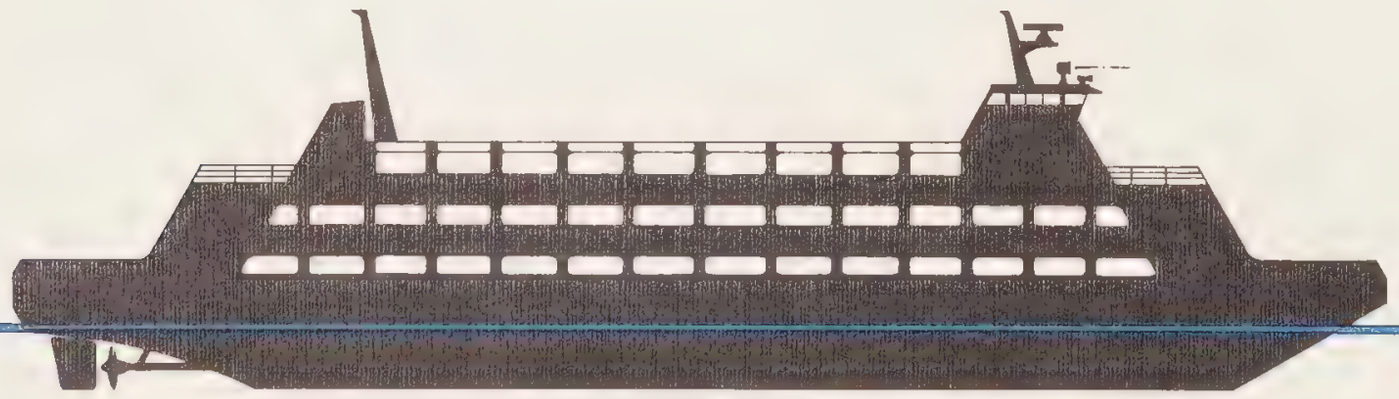
Sustained Sea Speed-25 knots
85 Gr. Tons; Pgrs 505
$2,100,000



Spaulding 165
P.F. Spaulding & Assocs., Inc.
L-165' B-30'6" Draft-6'
5000 S.H.P. Gas T.; Screws-2

Sustained Sea Speed-25 knots
99 Gr. Tons; Pgrs. -636
$2,100,000 (quote +10%)

Advanced Systems and Special Designs

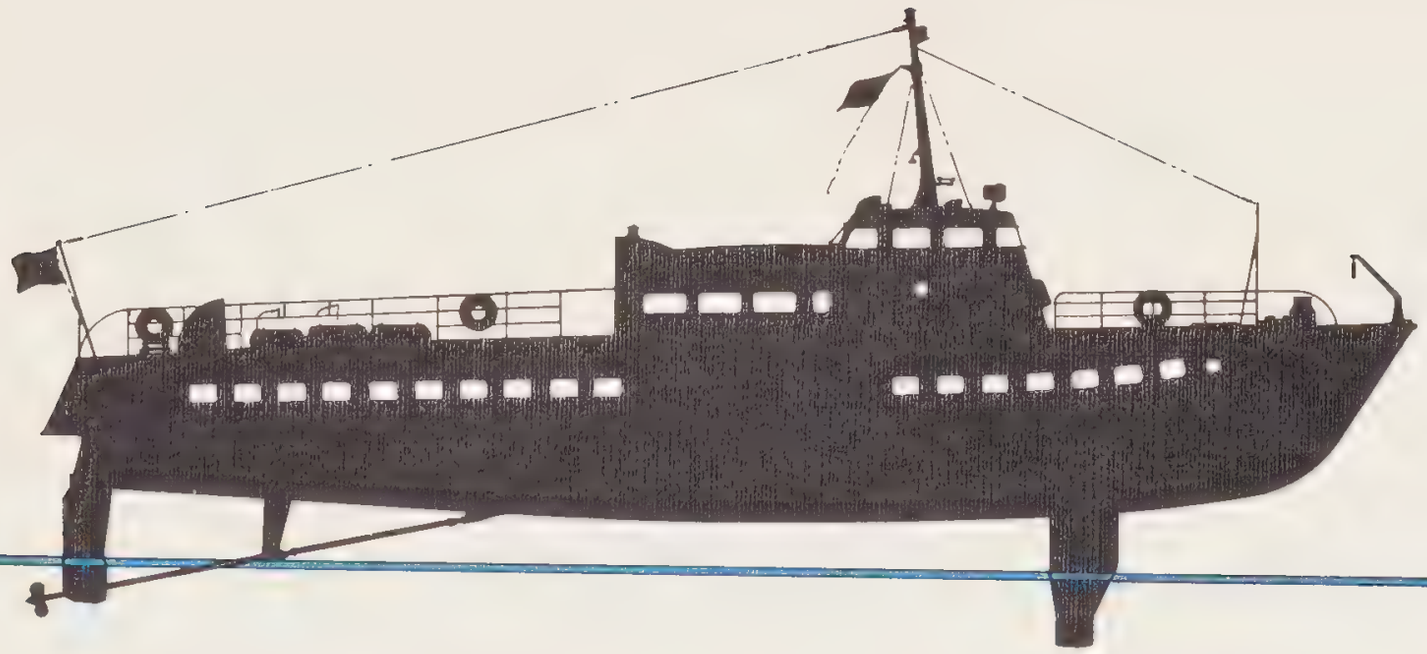


Catamaran Ferry
Bay Area Transportation Study
L-325' B-80' Draft-N.A.
9000 S.H.P. Gas T.; Screws-2

Sustained Sea Speed-23 knots
100+ Gr. Tons; Pgrs. -2500
$4,400,000 (BATS +10%)

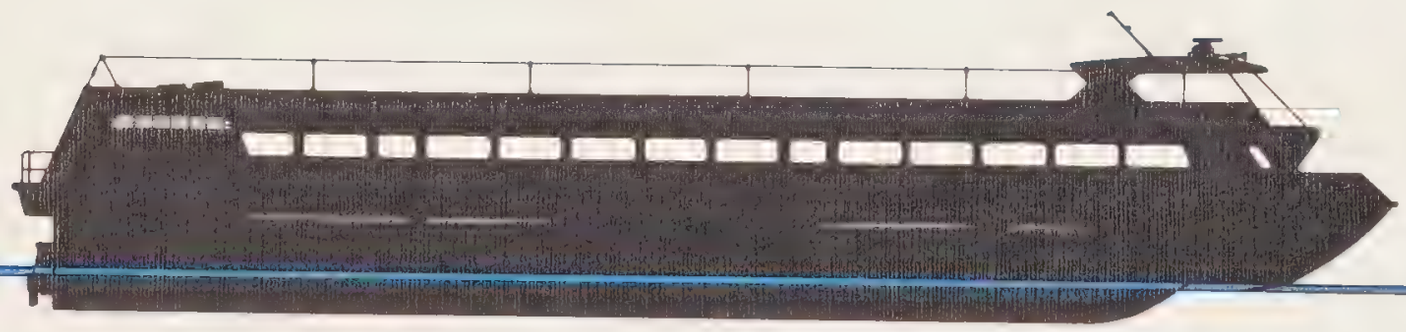
VT-I Hovercraft
Vosper Thornycroft, Ltd., G.B.
L-95'6" B-44'6" Draft-9'9"/3'9"
3700 S.H.P. Gas T. Screws-2

Sustained Sea Speed-40 knots
100+ Gr. Tons; Pgrs. 322
$1,320,000 Great Britain



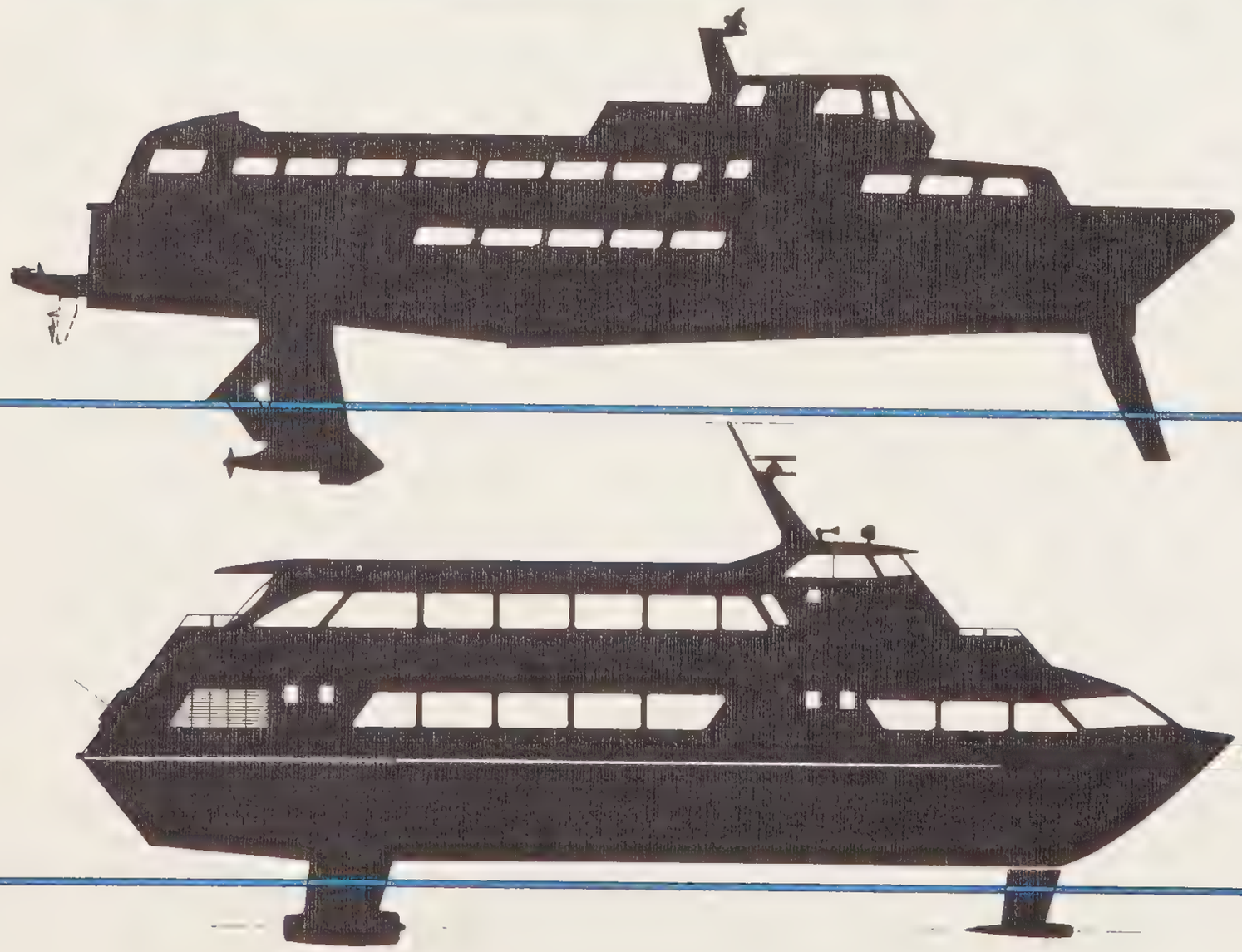
Supramar PT-150
Supramar Limited, Switzerland
L-123' B-52'6" Draft-18'/8'10"
6800 S.H.P. Diesel Screws-2

Sustained Sea Speed-39 knots
100 Gr. Tons; Pgrs. 250
$2,500,000 quoted USA



Hydro-Ski Ferry
Hydro-Ski International Corp.
L-114'3" B-38' Draft-0'37"
8000 S.H.P. Gas T. Hydro-jets-2

Sustained Sea Speed-35+ knots
99 Gr. Tons; Pgrs.-300
$1,650,000 (quote +10%)



Hydrodyne Commuter
Hydrodyne Marine Corporation
L-112'6" B-50' Draft-21'/6'
5000 S.H.P. Gas T. Screws-2 35+ kts.

Diesel Single screw Hullborne-7 knots
99 Gr. Tons; Pgrs.-300
$2,200,000 (quote +10%)

Boeing 929-110
The Boeing Corporation
L-93' B-35' Draft-10'6"/4'6"
5000 S.H.P. Gas T. Hydro-Jets-2

Sustained Sea Speed-35+ knots
99 Gr. Tons; Pgrs.-300
$3,000,000 (quote +10%)

DISCUSSION RELATED TO VESSEL CANDIDATES

Steel—Displacement Hull—Diesel Power

It was found that conventional steel hull, displacement type, diesel powered craft would be acceptable on the shorter less patronized route between Sausalito and San Francisco. These vessels would be too slow to provide attractive service on the longer runs between Corte Madera Creek or Gallinas Creek and San Francisco.

A modified "Golden Gate" Class answers all of the critera for the Sausalito-San Francisco (Southern Marin County) service. A complete operating cost analysis has been included in this report under System VII a & b. This system is recommended.

High Speed Displacement—Diesel Power

Several attractive candidates were found among the 20 knot vessels. The distance between Corte Madera Creek and the Ferry Building in San Francisco, however, is such that a twenty knot schedule would premit only five minutes terminal time for disembarking and loading passengers. The block time used is related to a frequency of service made necessary by projected commuter passenger demand and also to minimize the number of vessels servicing the route.

High Speed Displacement Hull—Gas Turbine

At a 25 knot service speed ten minutes at least would be allowed for terminal time on the Corte Madera Creek route. Sufficient margin also would remain to maintain a schedule in spite of short unexpected delays. Of all of the existing vessel designs studied the G. T. "Avalon" best answered the Corte Madera Creek-San Francisco service requirements. The G. T. "Avalon", however, was designed for coastwise operation. Many features would not be attractive to high volume commuter traffic.

For this reason a special 25 knot vessel was designed incorporating many of the features of the "Avalon" yet answering the specific requirements of the service. This vessel has been designated as the Spaulding 165 and is a high speed, aluminum hulled, gas turbine-zee drive propelled craft. The higher construction cost and greater operating expense has been given full consideration in this study and would in large part be offset by greater patronage due to shorter transit time and higher frequency of service. The Spaulding 165 Class answers all of the criteria for the Corte Madera Creek-San Francisco (Central Marin County) service. A complete operating cost analysis has been included in this report under System I a & b. This system is recommended.

Advanced Systems and Special Designs

Whereas a 25 knot service speed would provide an attractive and reliable ferryboat service from Corte Madera Creek to San Francisco, this speed is inadequate for the longer route from Gallinas Creek located north of Point San Pedro. At least a 35 knot service speed would be required on this route in order to make the service sufficiently attractive to divert commuters from their automobiles to the ferry system. Advanced system designs were studied in order to find a suitable vessel for the Gallinas Creek-San Francisco route. This investigation included the examination of air cushioned craft, hydrofoil craft and a Hydro-Ski Ferry.

In general, air cushion craft are bodily lifted out of the water by a downwardly directed blast of air which is retained by either a solid or flexible skirting. The skirting is designed to limit air escapement. The vessels actually ride on a bubble of air and are capable of high speeds due to the lack of surface resistance. Commercial models suitable for the Gallinas Creek service are manufactured and operating abroad. Examples include the Vickers-Thornycraft VT-1 (illustrated) Hover Marine, British Hovercraft Corp. and Westland Aircraft Company, all of the United Kingdom. Federal legislation prohibits importing foreign built craft for commercial operation on domestic water routes. Hovercraft satisfying the need for an attractive and economical San Francisco Bay ferry service to Northern Marin County are not being commercially produced in the United States. Experimental craft are presently being built by Bell Aerosystems Division of Textron, Aerojet General of the General Tire Company and General Dynamics under a federally funded joint Navy/Maritime Administration Surface Effect Ship experimental program. Commercial development will follow a comprehensive experimental testing program.

Transportation Technology, Inc. of Dallas, Texas have acquired the United States manufacturing rights to Hover Marine products, thus have acquired the knowledge and experience gained through Hover Marine's past efforts in the field but are not presently manufacturing a craft which would be suitable for the service. production of air cushioned craft in the United States remains several years in the future, therefore have not been considered in this study.

Hydrofoils are craft which are bodily lifted out of the water by a pair of submerged wings or foils. These vessels are capable of high speeds by the elimination of hull resistance, the foil resistance being only a fraction of normal hull resistance. Hydrofoils are classed generally as having surface piercing foils, submerged foils or a combination of both. Hydrofoils have enjoyed wide acceptance throughout the world. Most hydrofoils in commercial operation in the free world are of the Swiss designed Supramar type. The Russians have also produced successful shallow draft hydrofoils for use on rivers and are now selling them on a worldwide basis. An

American built Supramar PT-150 (illustrated) would not be suitable for service on San Francisco Bay for the reason that when hull-borne the fixed foils project downward and require a channel depth greater than eighteen feet.

Hydrodyne Marine Corporation of San Francisco is presently developing a commercial hydrofoil craft known as the Hydrodyne Commuter (illustrated) which combines the use of both surface piercing and submerged foils. The foil system is retractable and propulsion in hull borne/foil retracted mode is by means of an auxiliary inboard-outboard drive. Projected foilborne service speed is 40 knots but when hullborne with foils retracted the speed is seven knots. When the foils are extended foilborne the draft is eight feet and hullborne the draft is 21 feet. Hullborne with foils retracted the draft is six feet. A complete operating cost analysis of this craft was made and from all data studied the vessel appears to be very attractive. The craft was not recommended, however, because of the length of restricted channel depth at both Corte Madera Creek and Gallinas Creek. The slow speed of the craft in hullborne/foil retracted mode would overshadow the high speed capability in deep water.

Submerged foil hydrofoils are considered the "second generation" of hydrofoil craft. Their successful operation depends upon an expensive height sensing and stability control system. Most submerged foil hydrofoils have been designed for ocean waters having an ability to "profile" ocean waves providing a comfortable platform at high speed. Hydrofoil development in this country has been primarily directed toward this type of craft and has reached a high state of development.

Lockheed Aircraft Corporation, Grunman Aircraft Company, Pacific Hydrofoil Lines of Long Beach, California and the Boeing Company have been predominant in this field. Pacific Hydrofoil Lines owns and operates the "Victoria" (75 passengers) which is the only commercial submerged foil hydrofoil built and successfully operating in the United States. The company plans to build larger craft using the Victoria design. The present vessel requires more than eighteen feet of water when hullborne, therefore would be precluded from the Corte Madera Creek or Gallinas Creek service because of channel depth.

The Boeing Company has performed more research and built more successfully operating (navy) submerged foil craft than any other firm in the United States. At the request of Philip F. Spaulding and Associates, Inc., the Boeing Company designed the B929-110 (illustrated) submerged foil craft specifically for San Francisco Bay service. The vessel answers all of the operating criteria and a complete operating cost analysis has been included in this report under System II a & b. Two of these vessels operating in conjunction with three Spaulding 165's is recommended as an alternate plan for the Corte Madera-San Francisco (Central Marin County) service. This vessel design is also recommended for the Gallinas Creek-San Francisco (Northern Marin County) service.

At the request of Philip F. Spaulding and Associates, Inc., the Hydro Ski International Corporation of Florida designed a Hydro Ski Ferry (illustrated) specifically for San Francisco Bay service. This vessel answers all of the operating criteria and a complete operating cost analysis has been included with this study. The vessel operates with a draft of 37 inches while carrying 300 passengers. In order to achieve a 35 knot speed for the Gallinas Creek route, the company proposed the use of four gas turbine engines developing a total of 8,000 shaft horsepower. Unfortunately fuel and engine maintenance costs overrode the low capital cost advantage of this highly attractive vessel. Further technological improvements may change this situation; however this vessel design was reluctantly dropped from further consideration.

In the special design category a Catamaran ferry is illustrated. Catamarans are used extensively in Japan and were analyzed in order to determine their suitability for San Francisco Bay service. This type of craft proved to have the following limiting characteristics: a draft of fifteen feet and serious wake problem. Due to the large passenger capacity catamarans offer less frequency of service and gross underutilization during off-peak periods. High capital costs also entered into the decision to not pursue this type of craft further.

Recommended Vessels

Based upon the System Design Analysis we recommend the following:

- Sausalito-San Francisco (Southern Marin County) service:

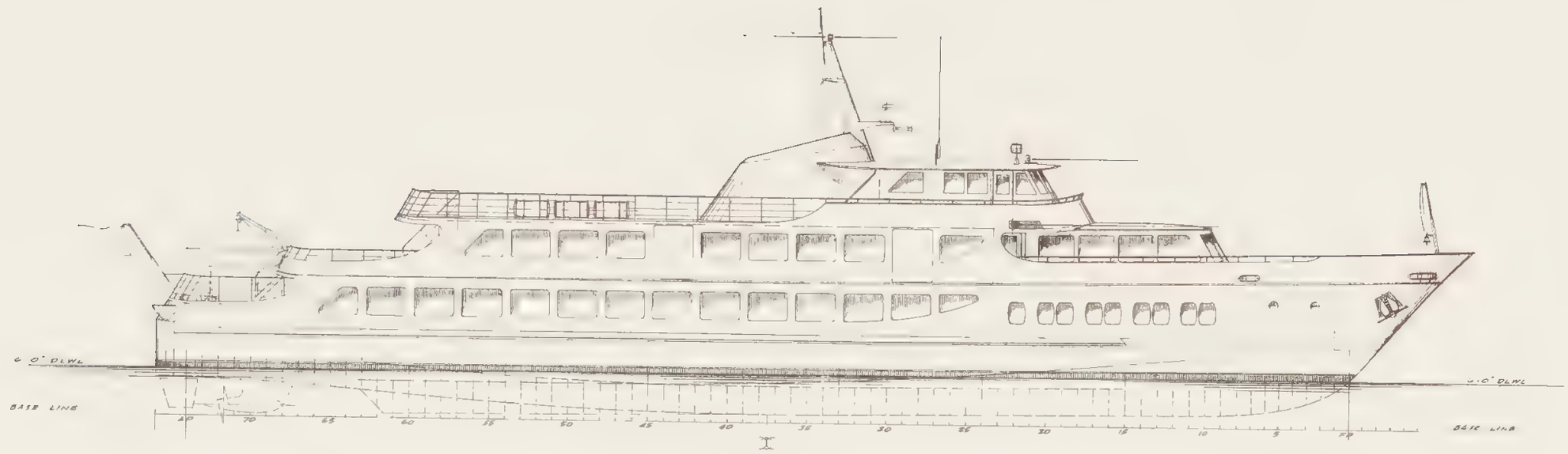
  The M. V. Golden Gate and one additional vessel of the modified Golden Gate Class.

- Corte Madera Creek-San Francisco (Central Marin County) service:

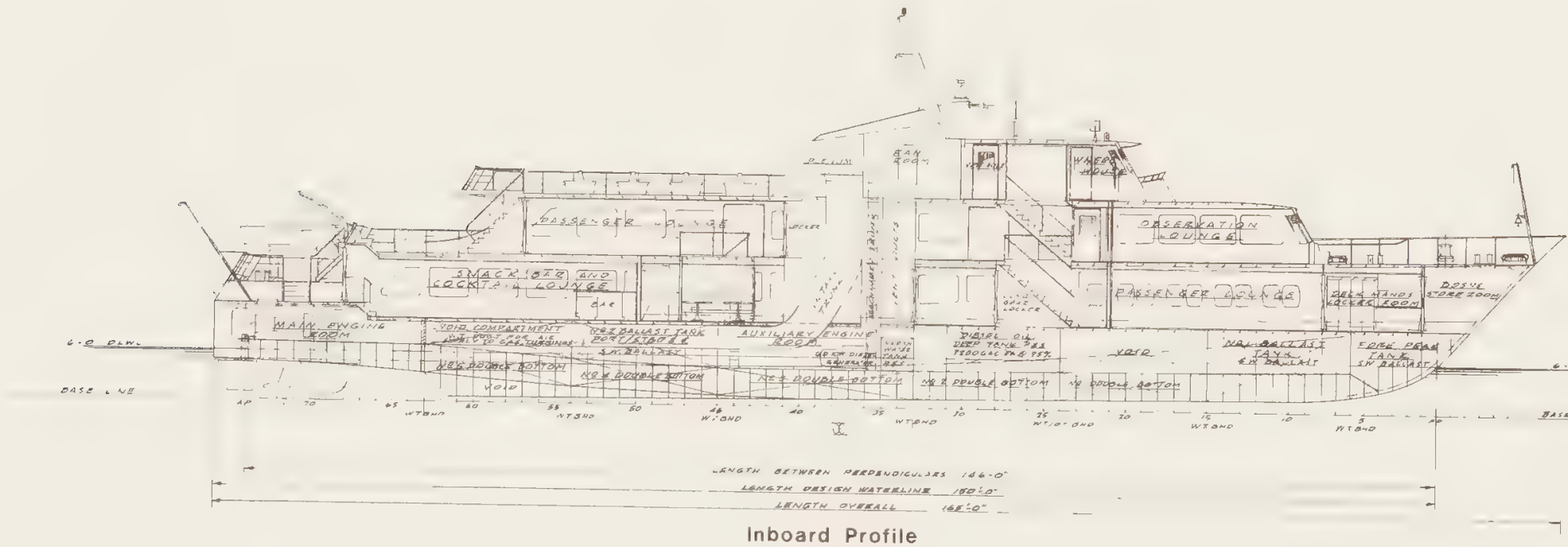
  5 Spaulding 165' Gas Turbine passenger ferries or alternatively:
  3 Spaulding 165' gas turbine passenger ferries and
  2 Boeing 929-110 Hydrofoils

- Gallinas Creek-San Francisco (Northern Marin County) service:

  Depending upon experience and build-up of service-
  2 Boeing 929-110 Hydrofoils.



Outboard Profile

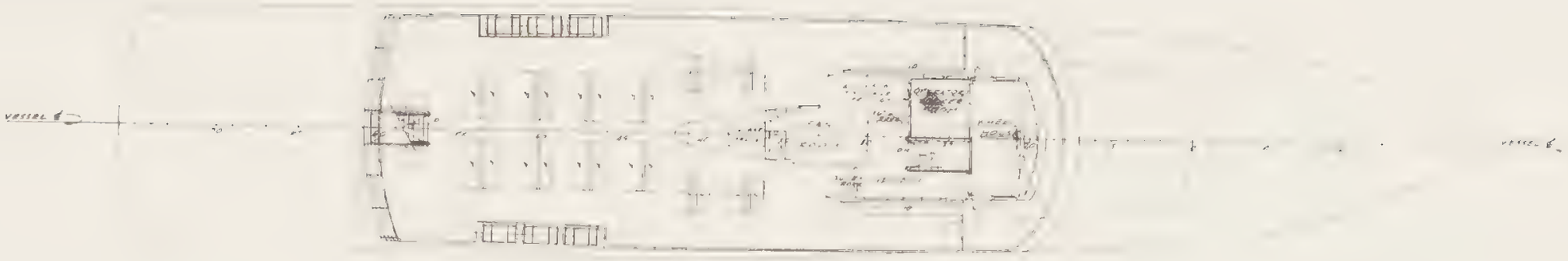


Inboard Profile

Spaulding 165
Gas Turbine Passenger Ferry

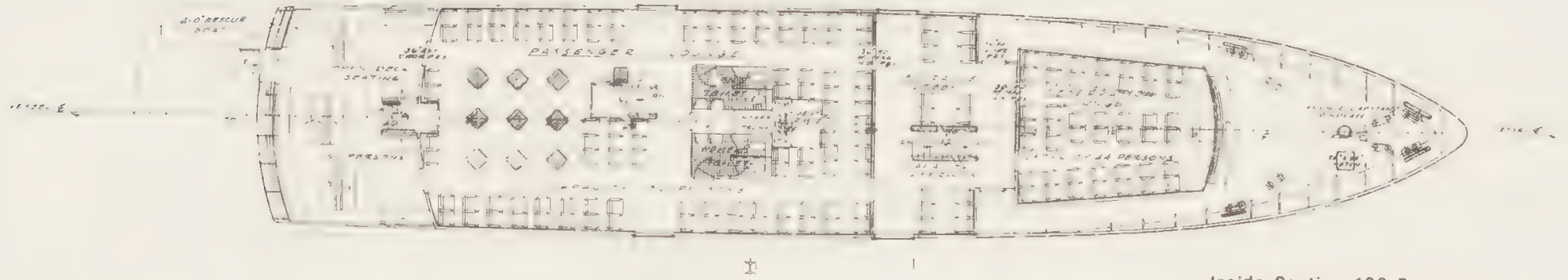
SCALE 1/8" = 1'-0"

Philip F. Spaulding And Associates Inc



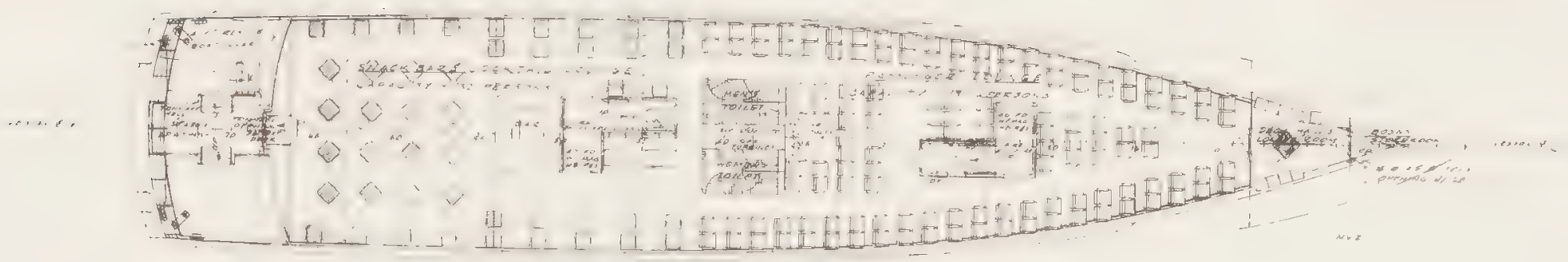
Sun Deck Plan

Outside Seating 116 Persons



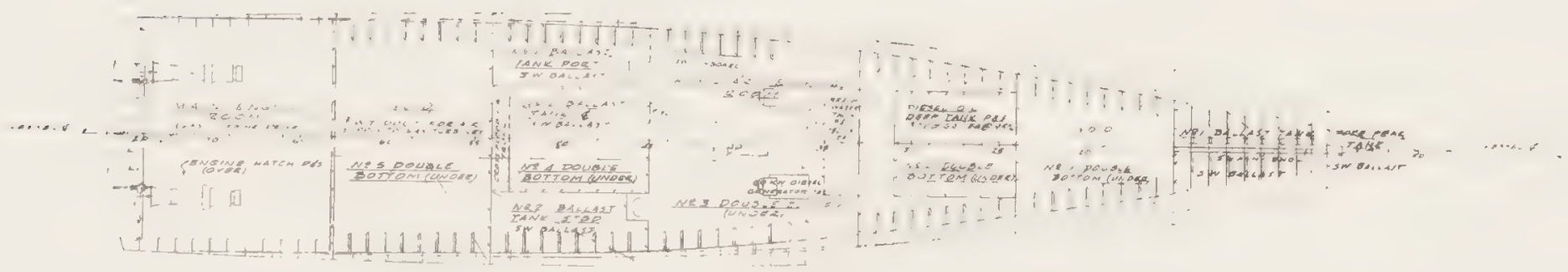
Upper Deck Plan

Inside Seating 196 Persons
Outside Seating 61 Persons
Total 257 Persons



Main Deck Plan

Inside Seating 263 Persons



Hold Plan

Spaulding 165
Gas Turbine Passenger Ferry

SCALE 1/8" = 1'-0"

Philip F. Spaulding And Associates Inc.

Spaulding 165

Ample open deck areas have been provided, together with a maximum length of unobstructed railing to give a feeling of spaciousness and freedom of movement about the vessel.

The length of the accommodation spaces permits only one fire zone. Two stairways provide access between decks and the forward stairway acts as an enclosed stair-tower, giving access to the Sun Deck. Passenger toilets are provided on the Main Deck and the Upper Deck.

By the use of Z-drive propulsion units the main propelling machinery is located aft of the passenger spaces. This arrangement saves weight, reduces cost and keeps the noise away from passenger accommodation spaces. Service accessibility is much improved as well.

Principal Dimensions:

Length overall	-	165′-0″
Length waterline	-	150′-0″
Length between perpendiculars	-	146′-6″
Breadth over guards	-	32′-0″
Breadth molded	-	30′-6″
Depth of hull amidships	-	9′-0″
Draft mean design	-	5′-0″
Draft maximum (propellers)	-	7′-0″
Displacement	-	220 long tons

Capacities:

Fuel Oil	-	6400 gallons
Fresh Water	-	1500 gallons

Propulsion Machinery:

Twin Gas Turbines driving through Hydro Drive units with controllable pitch propellers (maximum SHP total) - 5000

Auxiliaries:

Two Ships Service Generators - 60 KW each

Design Criteria

This design meets the following criteria:

- 636 passenger capacity
- Under 100 gross tons (admeasurement)
- 25 knot service speed
- Gas turbine propulsion
- Unmanned machinery spaces
- Total Bridge control
- Minimum crew
- Heated and well ventilated passenger spaces
- Excellent interior appointments.
- Provision for pets and bicycles

Configuration

The general arrangements are shown on the preliminary design drawings attached to and forming a part of this report. Larger size drawings and specifications appear in the pocket appendix.

Proportions have been selected for good speed and sea keeping and the vessel will fully comply with all of the U. S. Coast Guard Regulations for small passenger vessels, certified for carrying passengers for hire on lakes, bays and sounds, and will be built to class and classed by the American Bureau of Shipping. The vessel also will comply with the requirements of the U. S. Public Health Service.

Total inside passenger seating capacity provides for 459 persons and is arranged in five general areas:

Main Deck:

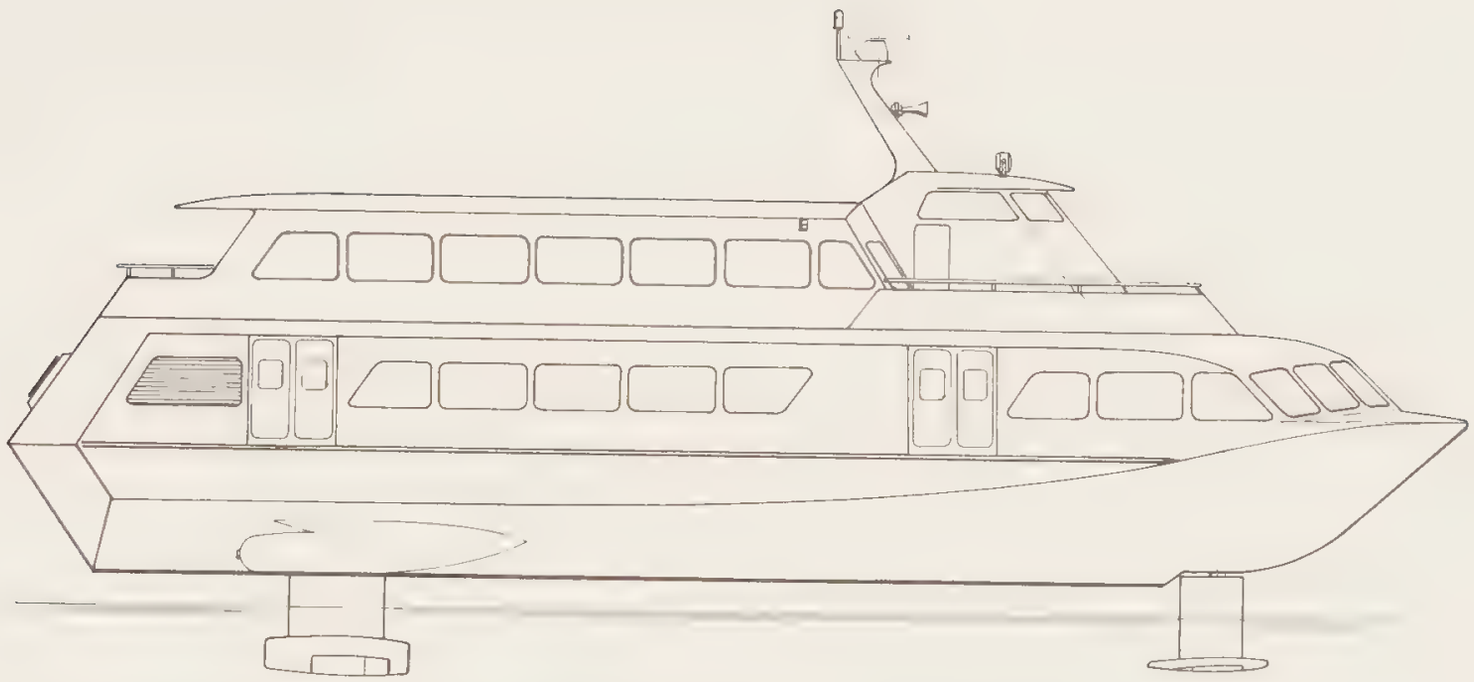
Forward Passenger Lounge	-	131 persons
Snack Bar and Cocktail Lounge	-	132 persons

Upper Deck:

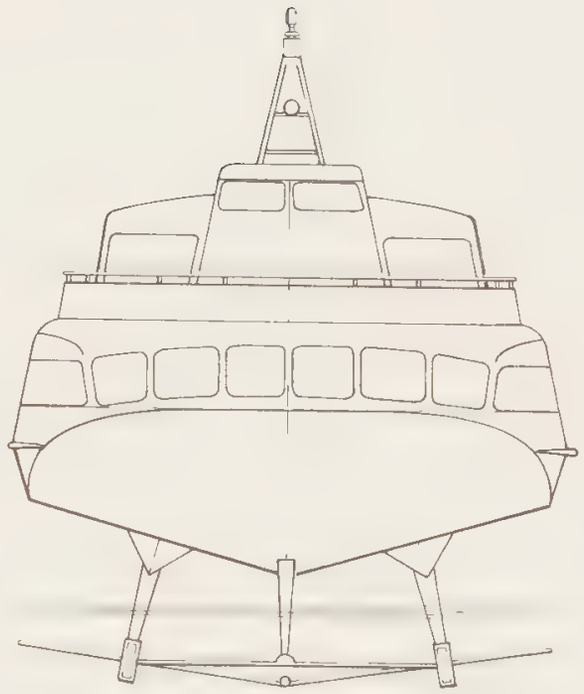
Observation Lounge	-	44 persons
Entrance Lobby	-	16 persons
Passenger Lounge	-	136 persons

Total outside passenger seating capacity provides for 177 persons and is arranged in two general areas:

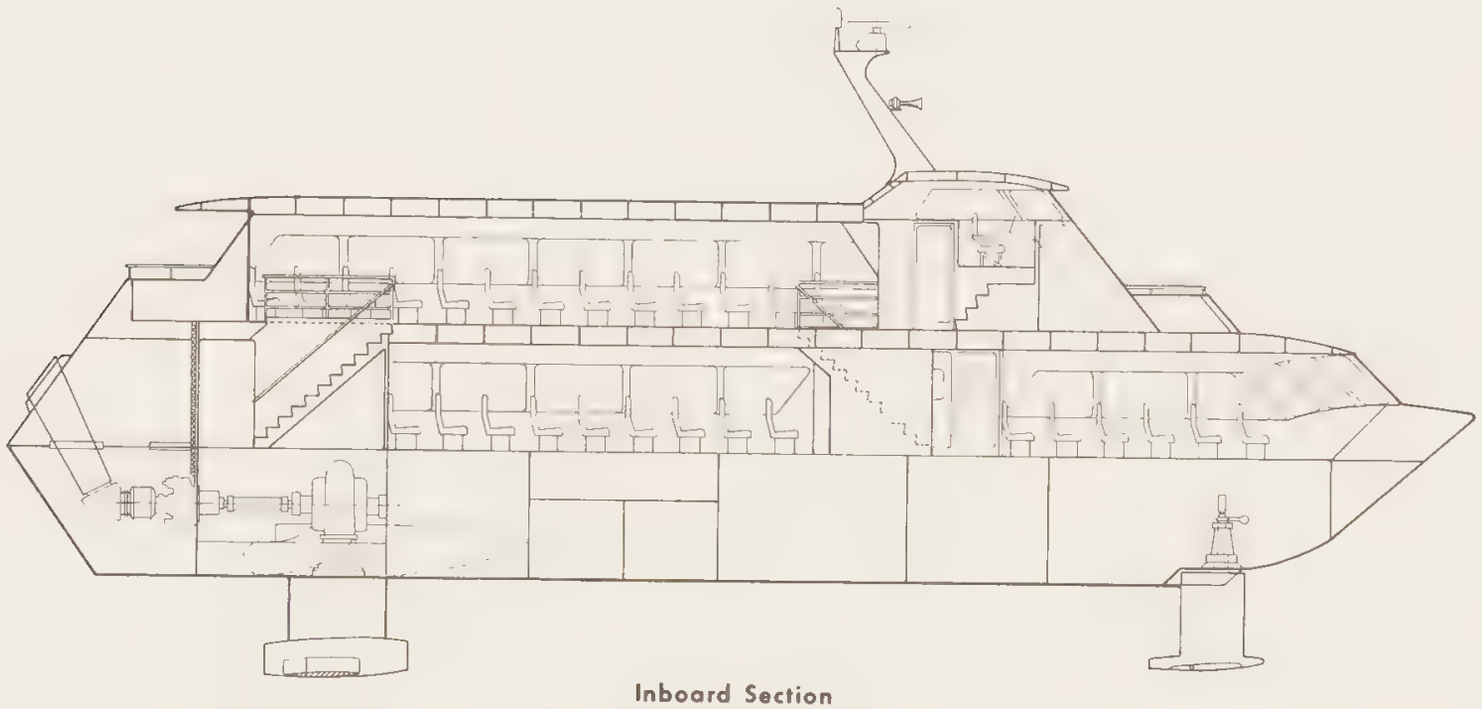
Upper Deck	-	61 persons
Sun Deck	-	116 persons



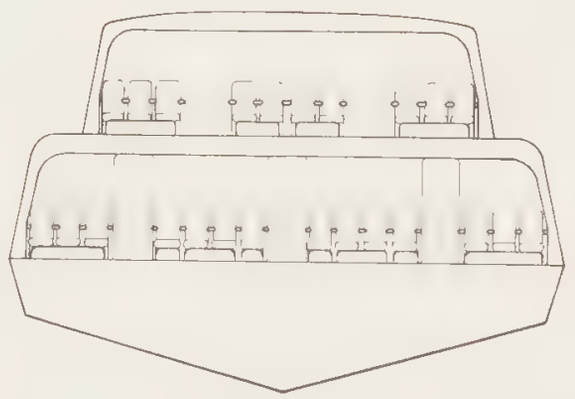
Outboard Profile



Bow Profile



Inboard Section



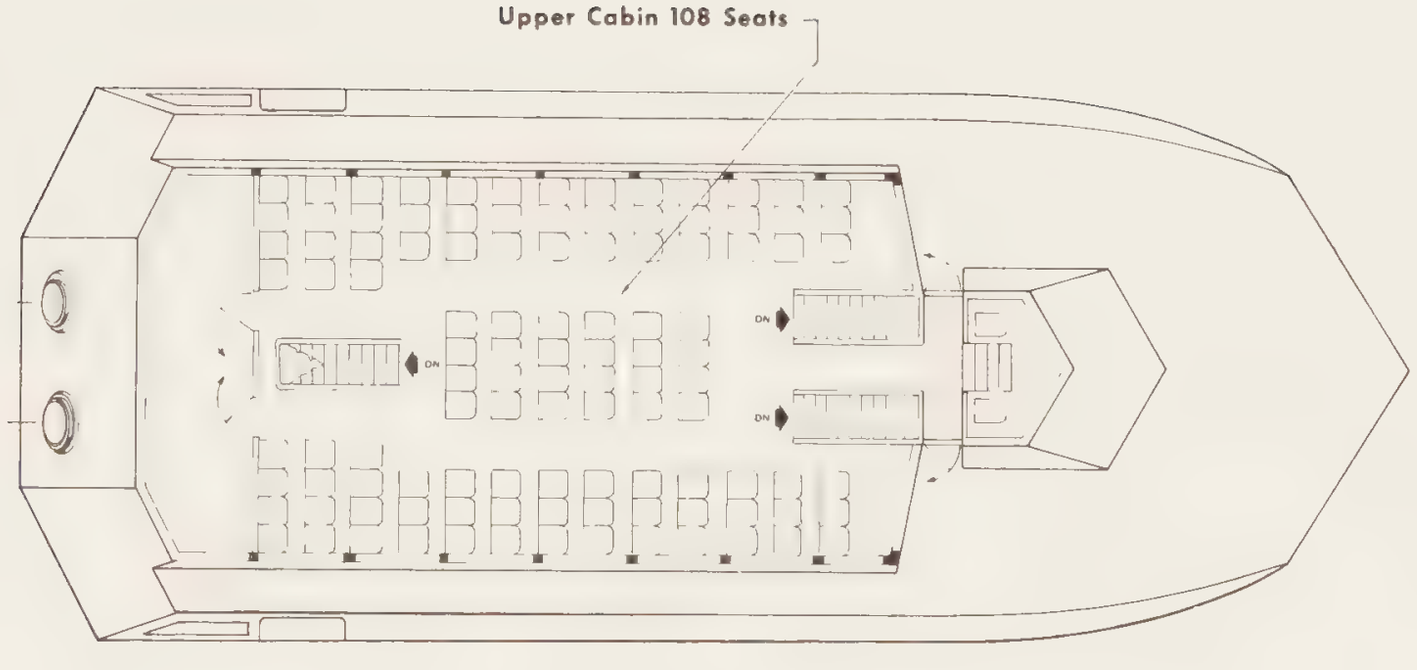
Midship Section

"929"

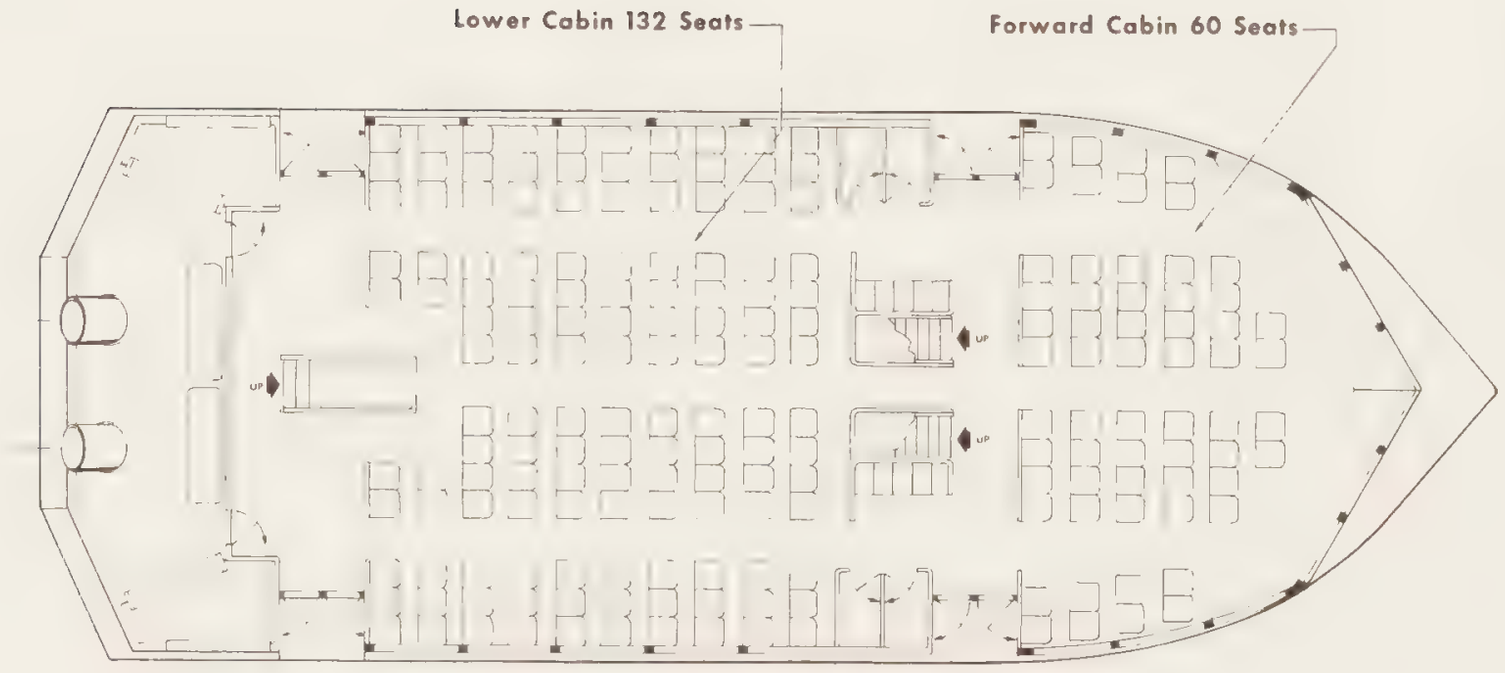
Waterjet Hydrofoil Boat Profiles and Sections

SCALE 3/16"= 1 FOOT

THE BOEING COMPANY



Upper Deck Plan



Lower Deck Plan

BOEING MODEL 929–110

Passenger Capacity = 300

Length = 93 Feet

Beam = 35 Feet

Draft:

Foilborne 4.5 Feet

Hullborne 10.5 Feet

Propulsion:

Two 2,500 hp Gas

Turbine-Waterjets

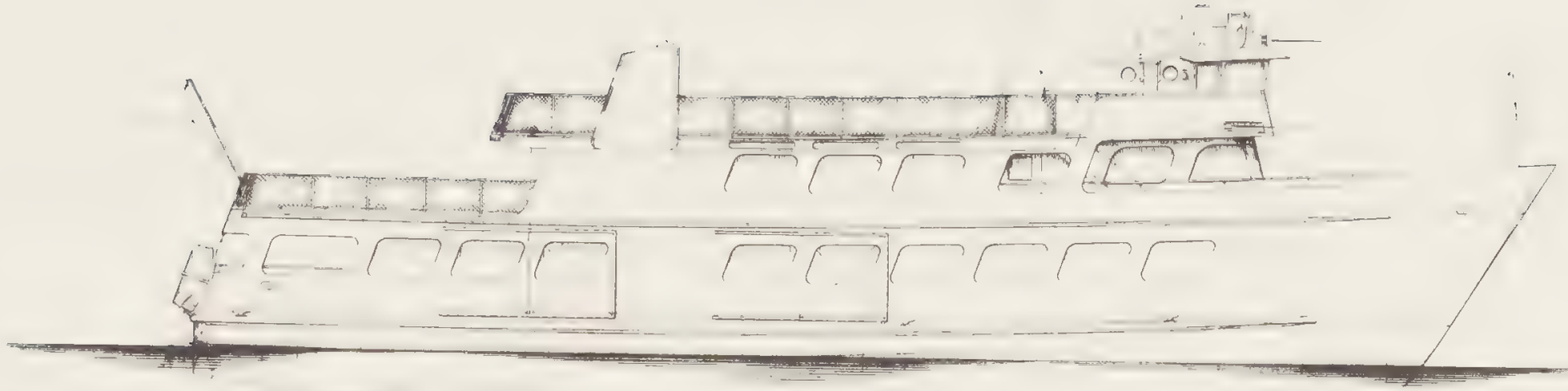
Service Speed: 40 Knots

"929"

Waterjet Hydrofoil Boat Deck Plans

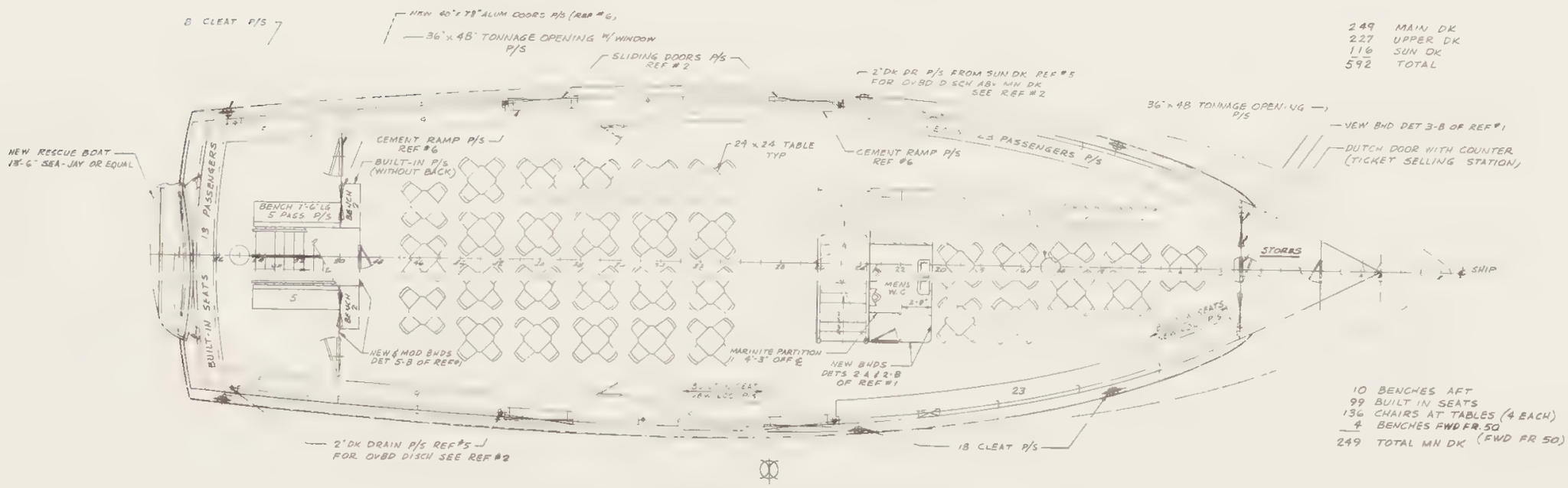
SCALE 3/16" = 1 FOOT

THE BOEING COMPANY



Outboard Profile

Upper Deck



Main Deck

249 MAIN DK
227 UPPER DK
116 SUN DK
592 TOTAL

M. V. Golden Gate

M. V. Golden Gate

The M. V. Golden Gate presently uses its lower deck for loading and unloading passengers. This procedure was required in order to make use of the existing passenger float at the San Francisco terminal and the newly designed terminal facilities at South Sausalito. The recommended loading floats for the proposed ferryboat system provide for both upper and lower deck loading. Upper deck loading is preferable as it facilitates expedicious transfer of passengers between vessels and floats at terminals. Aboard ship, upper deck loading permits better utilization of vessel space for passenger comfort and mobility.

The Spaulding 165 is designed with upper deck loading. The Boeing Company reports that upperdeck loading can easily be incorporated into the final design of its Hydrofoil. The present M. V. Golden Gate can be easily modified for upper deck loading, and the new design for the Golden Gate Class vessel, tailored to the needs of the Southern Marin crossing would include this feature.

System Design

System Design

This section combines the components discussed earlier into an optimum system proposal. Criteria for optimum system design gave consideration to the goals, pride and heritage of the regions and communities to be served, their ecological and aesthetic settings. Within the design process, vessel capabilities were weighed in light of existing and proposed transportation services and needs. Financial feasibility, however, has been considered the foundation for building the system.

The four demand models were utilized in conjunction with the operational capabilities and cost characteristics of the various vessel candidates to determine optimum systems. The operating cost characteristics of the candidates is illustrated. The cost of providing sufficient capacity to satisfy commuter peak demand using different combinations of vessel candidates is demonstrated. In the examples, the cost of financing is computed on one hundred per cent borrowed capital repaid in twenty years at eight and three quarters % interest. This calculation was used to reflect as nearly as possible the full cost of providing the service. Variations of financing the system are also demonstrated. Potential revenue from food and beverage concessions was purposely omitted to enhance conservatism in the revenue projections.

The capabilities of vessels and vessel combinations were matched with the basic service assumptions underlying each demand model. These service assumptions required that sufficient system capacity be provided to satisfy peak commuter demand. Where matching of system capability to service assumptions was not possible, adjustments were made in the models to allow for these discrepancies. For example, when the quality of service being evaluated was less than that of the model, the potential demand for that system was reduced. When the quality of service was greater, the demand was increased accordingly.

Evaluations of all systems clearly emphasized that the potential demand for ferryboat service on the Bay typifies the traditional bimodel weekday unidirectional peak demand condition that plagues all commuter transit systems. Transit capacity designed to satisfy commuter peaks becomes a financial burden during off-peak periods due to underutilization. The models were readjusted to reflect the potential earning capacity of the various systems during periods of underutilization. This adjustment permitted each proposed system to take maximum advantage of its potential off-peak and weekend market as well as the commuter market. Financial feasibility evaluations using the off-peak and weekend market adjustment differed significantly from those derived earlier, e.g., some less costly systems demonstrated lower feasibility, while some higher cost systems demonstrated higher feasibility because of their higher earning capacity during the offpeak periods.

Proposed Time Schedules

Corte Madera—San Francisco Service					Sausalito—San Francisco Service			
Depart C.M.	Arrive SFO	Depart SFO	Arrive C.M.		Depart Sau.	Arrive SFO	Depart SFO	Arrive Sau.
				AM				
5:30	6:10	6:15	7:00		6:50	7:15	7:20	7:45
6:00	6:40	6:45	7:30		7:20	7:45	7:50	8:15
6:30	7:00	7:05	7:40		7:50	8:15	8:20	8:45
7:00	7:30	7:40	7:45		8:20	8:45	8:50	9:15
7:10	7:40	7:45	8:10		8:50	9:15	9:20	9:45
7:30	8:00	8:05	8:15		9:20	9:45	9:50	10:15
7:40	8:15	8:30	8:50		9:50	10:15	10:20	10:45
7:45	8:20	8:35	9:15		10:20	10:45	10:50	11:15
8:15	8:45	8:55	9:45		10:50	11:15	11:20	11:45
8:20	9:20	9:05	10:15		11:20	11:45	11:50	
8:50	9:50	9:30	10:45		11:50			
9:15	10:20	10:00	11:15					
9:45	10:50	11:00	11:45					
10:15	11:25	11:30						
10:45	11:50	12:00						
11:15								
11:45								
				PM				
12:15	12:25	12:30	12:15		12:20	12:15	12:20	12:15
1:00	12:55	1:00	1:00		12:50	12:45	12:45	12:45
1:45	1:40	1:45	1:45		1:20	1:15	1:20	1:15
2:30	2:25	2:30	2:30		1:50	1:45	1:45	1:45
3:15	3:10	3:15	3:15		2:20	2:15	2:20	2:15
4:00	3:00	4:00	4:00		2:50	2:45	2:45	2:45
4:25	4:40	4:30	4:15		3:20	3:15	3:20	3:15
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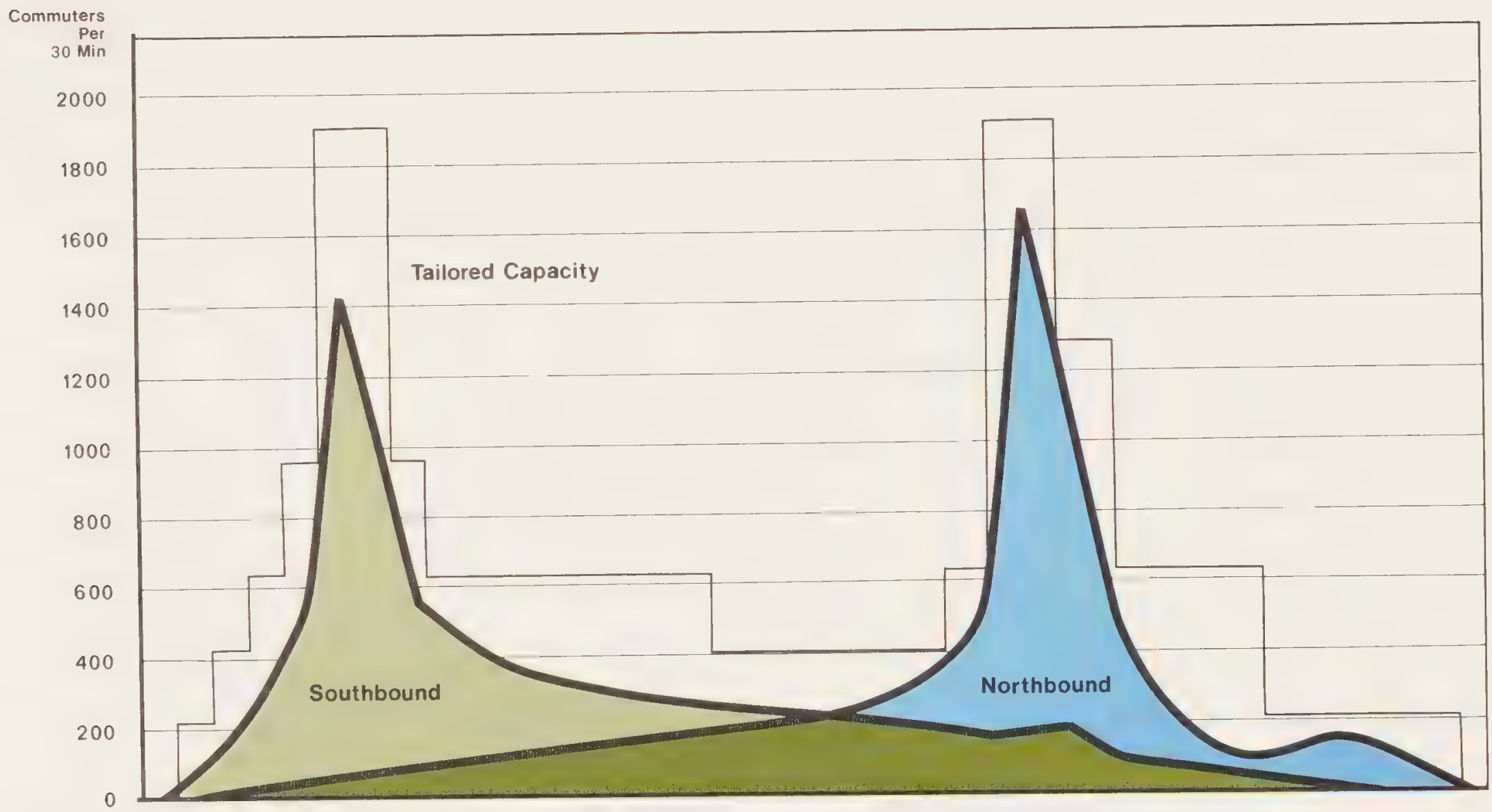
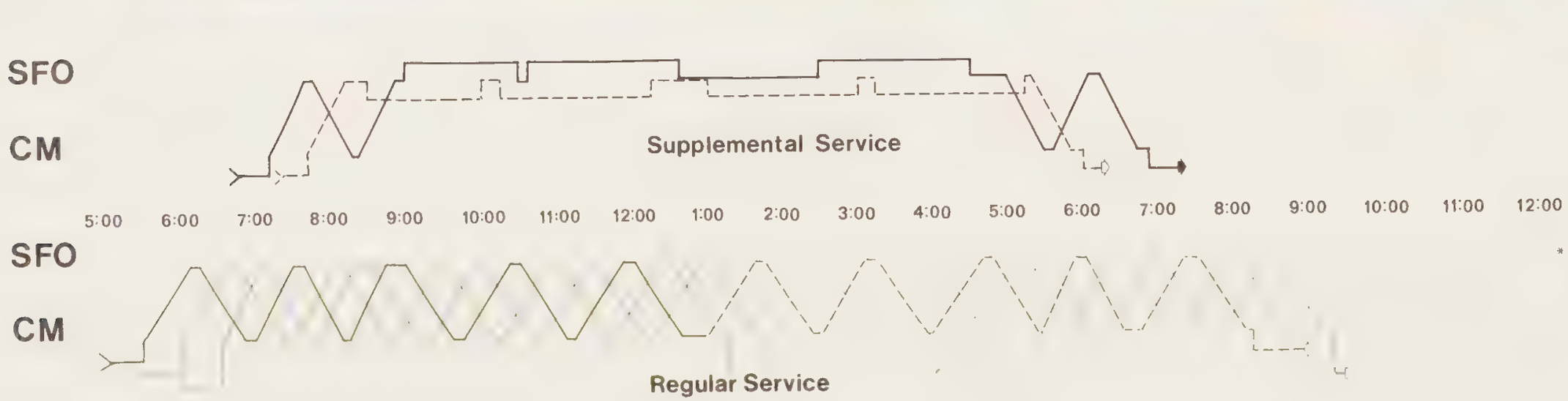
5:45	6:05	5:20	5:45		5:20	5:15	5:20	5:15
6:15	6:25	5:30	6:05			5:45	5:45	5:45
6:45	6:55	5:50	6:15					6:15
7:15	7:20	6:10	6:45					
7:45	8:55	6:30	7:15					
8:15	8:25	7:00	7:45					
8:45	9:25	7:30	8:15					
10:15	10:50	8:00	8:45					
		8:30	10:15					
		9:30						
		11:30						

Bay Circle Cruise	
Depart	Arrive
8:35	10:00
9:00	10:30
10:15	12:15
10:40	12:40
1:00	3:00
2:30	4:30
3:15	5:15

Commuter Traffic/System Capacity





*Broken line indicates change in crew.

Comparison of Candidate Characteristics

Vessel Characteristics	Golden Gate	Hawaii State	Blount 500	Halter 500	Blount 624	Spaulding 209′	G. T. Avalon	Spaulding 165′	Hydro-Ski	Hydroyne	Boeing 929
Sustained Service Speed	15	16	20	20	20	20	25	25	35+	35+	35+
Inside Seating Capacity	440	—	500	471	624	756	505	459	300	300	300
Outside Seating Capacity	142	—	—	35	—	220	—	177	—	—	
Total Seating Capacity	582	500	500	506	624	976	505	636	300	300	300
Enclosed Deck Area in Sq. Ft.	5,710[a]	4,224[a]	3,410	4,266	6,930	7,934	3,265	4,624	2,804	2,669	2,875
Enclosed Deck Area per Inside Seat (ft^2)	9.84[a]	8.45[a]	6.8	9.05	11.1	10.5	6.05	10.0	9.25	8.9	9.6
Seating Arrangements:	Casual	Casual	20″ W	22″ W	20″ W[b]	22″ W[b]	18″ W[b]	22″ W[b]	22″ W[b]	18″ W[b]	22″ W[b]
	—	—	32″ P	36″ P	33″ P[b]	36″ P[b]	36″ P[b]	36″ P[b]	36″ P[b]	36″ P[b]	36″ P[b]
	—	—	Airline	—	2-3A[b]	2A[b]	3A[b]	2A[b]	3A[b]	2 + 3A[b]	3A[b]
	—	—	—	—	+Casual	+Casual	+Casual	+Causual	Airline	Airline	Airline
Avg. Total DOC/Seat a. mi. (5,082 hrs/yr)	0.0080	0.0092	0.0084	0.0106	0.0078	0.0072	0.0124	0.0099	0.0208	0.0180	0.0169
(3,847 hrs/yr)	0.0088	0.0100	0.0091	0.0116	0.0085	0.0080	0.0133	0.0107	0.0220	0.0193	0.0185
Avg. Total DOC + Finance/Seat n. mi. (5,082 hrs/yr)	0.0097	0.0109	0.0102	0.0140	0.0095	0.0101	0.0159	0.0127	0.0241	0.0223	0.0229
(3,847 hrs/yr)	0.0110	0.0123	0.0114	0.0161	0.0108	0.0117	0.0179	0.0143	0.0264	0.0251	0.0264
Block Time:[c] One Way & Round Trip-San Francisco (minutes)											
Callinas Creek	78-156	74-148	61-120	61-120	61-120	61-120	51-102	51-102	40-80	40-80	40-80
Corte Madera Creek	60-120	57-114	40- 80	40- 80	40- 80	40- 80	35- 70	35- 70	30-60	30-60	30-60
Tiburon	30- 60	28- 56	25- 50	25- 50	25- 50	25- 50	22- 44	22- 44	18-36	18-36	18-36
North Sausalito	45- 90	43- 86	35- 70	35- 70	35- 70	35- 70	30- 60	30- 60	25-50	25-50	25-50
South Sausalito	30- 60	28- 56	25- 50	25- 50	25- 50	25- 50	22- 44	22- 44	18-36	18-36	18-36

Notes: [a] Total Area and Total Area/Total Seats

[b] Window Seatting: "A" = Abreast
"P" = Pitch or distance between seat centers
"W" = Seat Width

[c] Ferryboat Block Time includes: Transfer time, cast-off, maneuver, accelerate to service speed, decelerate from service speed, maneuver, dock, and transfer time. The two transfer time allowances, beginning and ending, sum to the turnaround time at one terminal. Doubling the block time given provides round trip time for vessels at the speeds given.

Comparison/Operating and Financing Costs

	MV Golden Gates Operating Hours		MV Hawaii State Operating Hours		Blount 500 Operating Hours		Halter 500 Operating Hours		Blount 624 Operating Hours		Spaulding 209 Operating Hours	
	5082	3847	5082	3847	5082	3847	5082	3847	5082	3847	5082	3847
Annual Direct Operating Cost												
1. Wages & Allowances	254,899	206,241	254,899	206,241	254,899	206,241	254,899	206,241	282,328	229,093	282,328	229,093
2. Stores Supplies & Eqt.	2,260	2,260	2,440	2,440	2,812	2,812	4,780	4,780	5,100	5,100	8,110	8,110
3. Other Vessel Expense	2,240	2,240	2,140	2,140	1,540	1,540	3,050	3,050	4,620	4,620	6,160	6,160
4. Maintenance & Repair	9,340	9,340	9,780	9,780	8,560	8,560	17,210	17,210	16,140	16,140	20,910	20,910
5. Insurance	35,000	35,000	34,120	34,120	41,250	41,250	82,500	82,500	50,975	50,975	132,500	132,500
6. Fuel Oil - Auxiliaries	2,460	1,865	2,800	2,120	2,800	2,115	2,840	2,150	3,490	2,640	4,340	3,285
Total Fixed Operating Cost	306,199	256,946	306,179	256,841	311,861	262,518	365,279	315,931	362,653	308,568	454,348	400,058
7. (Fuel Oil Underway included in hourly direct operating cost below.)												
8. Financing Cost Per Year	74,232	74,232	72,323	72,323	87,487	87,487	174,975	174,975	107,901	107,901	281,020	281,020
Hourly Direct Operating Cost (in dollars)												
Average F-DOC/Hour (At Terminal)	60.26	66.79	60.25	66.76	61.37	68.25	71.88	82.13	71.37	80.22	89.39	103.99
Underway Costs/Hour	9.95	9.95	13.10	13.10	22.95	22.95	35.26	35.26	26.20	26.20	51.57	51.57
Average T-DOC/Hour (Underway)	70.21	76.74	73.35	79.86	84.32	91.20	107.14	117.39	97.57	106.42	140.96	155.56
Average F-DOC + Finance/Hour	74.86	86.08	74.48	85.55	78.58	90.99	106.31	127.61	92.60	108.27	144.69	177.03
Average T-DOC + Finance/Hour	84.81	96.03	87.58	98.65	101.53	113.94	141.57	162.87	118.80	134.47	196.26	228.60
Average T-DOC/N. Mile	4.68	5.12	4.58	4.99	4.22	4.56	5.36	5.87	4.88	5.32	7.05	7.78
Average T-DOC/Seat/N. Mile	0.0080	0.0088	0.0092	0.0100	0.0084	0.0091	0.0106	0.0116	0.0078	0.0085	0.0072	0.0080
Average T-DOC/+ Fin/N. Mile	5.65	6.40	5.47	6.17	5.08	5.70	7.08	8.14	5.94	6.72	9.81	11.43
Average T-DOC + Fin/Seat/N. Mile	0.0097	0.0110	0.0109	0.0123	0.0102	0.0114	0.0140	0.0161	0.0095	0.0108	0.0101	0.0117

Note: Figures developed from analysis in Supplement #1

Comparison/Operating and Financing Costs

	G. T. Avalon Operating Hours		Spaulding 165 Operating Hours		Hydro-Ski Operating Hours		Hydrodyne Operating Hours		Boeing Operating Hours	
	5082	3847	5082	3847	5082	3087	5082	3087	5082	3087
Annual Direct Operating Cost										
1. Wages & Allowances	254,899	206,241	254,899	206,241	276,141	223,980	276,141	223,980	276,141	223,980
2. Stores, Supplies & Eqt.	3,010	3,010	2,190	2,190	1,180	1,180	720	720	1,325	1,325
3. Other Vessel Expense	2,670	2,670	3,330	3,330	1,790	1,790	–	–	–	–
4. Maintenance & Repair	15,750	15,750	18,418	18,418	50,820	50,820	40,000	40,000	65,400	65,400
5. Insurance	105,000	105,000	105,000	105,000	89,200	89,200	114,000	114,000	145,000	145,000
6. Fuel Oil - Auxiliaries	2,820	2,140	2,907	2,200	–	–	1,680	1,270	–	
Total Fixed Operating Cost	384,149	334,811	387,994	338,629	419,131	366,970	432,541	379,970	487,866	435,705
7. (Fuel Oil Underway included in hourly direct operating cost below.)										
8. Financing Cost Per Year	222,695	222,695	222,695	222,695	174,975	174,975	233,300	233,300	318,136	318,136
Hourly Direct Operating Cost (in dollars)										
Average F-DOC/Hour (At Terminal)	75.60	87.04	76.35	88.02	82.47	95.40	85.11	98.77	96.00	113.25
Underway Costs/Hour	81.46	81.46	81.46	81.46	136.00	136.00	103.80	103.80	81.48	81.48
Average T-DOC/Hour (Underway)	157.06	168.50	157.81	169.48	218.47	231.40	188.91	202.57	177.48	194.73
Average F-DOC + Finance/Hour	119.42	144.92	120.17	145.90	116.90	140.88	131.02	159.41	158.60	195.94
Average T-DOC + Finance/Hour	200.88	226.38	201.63	227.36	252.90	276.88	234.82	263.21	240.08	277.42
Average T-DOC/N. Mile	6.28	6.74	6.31	6.78	6.24	6.61	5.40	5.79	5.07	5.56
Average T-DOC/Seat/N. Mile	0.0124	0.0133	0.0099	0.0107	0.0208	0.0220	0.0180	0.0193	0.0169	0.0185
Average T-DOC + Fin/N. Mile	8.04	9.06	8.07	9.09	7.23	7.91	6.71	7.52	6.86	7.93
Average T-DOC + Fin/Seat/N. Mile	0.0159	0.0179	0.0127	0.0143	0.0241	0.0264	0.0223	0.0251	0.0229	0.0264

Note: Figures developed from analysis in Supplement #1

System Comparison 1972

System	Vessels	No. Vessels: Regular Service	No. Vessels: Supplement. Service.	No. Vessels: Total	RT/Weekday	RT/S-S-H	Reg. Sched. Intervals in min.	Peak Period Ave. Int. in min.	OW Fares	BCC/Day Weekdays	BCC/Day S-S-H	BCC Fare
Corte Madera Service – 25 knot service – Block time 40 min. and 30 min.												
I a	 S 165	3	2	5	30	18	30	11	50¢	10	9	$2.00
I b		3	2	5	30	18	30	11	50¢	10	9	2.00
II a	 B · 929	3	2	5	30	18	30	10	50¢	9	9	3.50
II b		3	2	5	30	18	30	10	50¢	9	9	3.50
Corte Madera Service – 20 knot vessels – Block time 45 min.												
III a	 Blount 500	3	2	5	32	18	30	15	75¢	10	9	1.75
III b		3,	3	6	33	18	30	13	50¢	18	16	1.75
IV a	 Halter 500	3	2	5	32	18	30	15	75¢	10	9	1.75
IV b		3	3	6	33	18	30	13	50¢	15	13	1.75
V a	 Blount 624	3	1	4	31	18	30	18	75¢	5	4	1.75
V b		3	2	5	32	18	30	15	50¢	10	9	1.75
VI a	 S - 209	3	0	3	30	18	30	30	75¢	0	0	0
VI b		3	1	4	31	18	30	18	50¢	5	4	1.75
Sausalito Service – 15 knot vessels – Block time 30 min.												
VII a	 Golden Gate	2	0	2	20	18	30	30	50¢	0	0	0
VII b		2	0	2	30	18	30	30	50¢	0	0	0

Traffic		Annual Revenue			Total Vessel DOC/Yr. $000's	Gross Profit From Operations $000's	Financing Expense		
Weekday Commuters	Commuters + Non-Commuters	Regular Service $000's	Supplemental Service $000's	Total $000's			Investment Vessels $000's	Finance Cost/Yr. @ 7.0% $000's	Financing Cost/Yr. @ 8.75% $000's
3,792	4,989	2,149	1,932	4,080	3,408	$ 672	$10,500	977	1,113
4,171	5,488	2,364	1,932	4,296	3,408	887	10,500	977	1,113
4,500	6,466	2,785	1,573	4,358	3,584	774	12,300	1,144	1,304
4,800	6,800	2,929	1,573	4,502	3,584	918	12,300	1,144	1,304
3,015	3,620	2,339	949	3,287	1,905	1,383	4,125	384	437
3,500	4,600	1,981	1,401	3,383	2,241	1,142	4,950	461	525
3,015	3,620	2,339	949	3,288	2,411	877	8,250	768	875
3,500	4,600	1,981	1,401	3,383	2,839	544	9,900	921	1,050
3,015	3,620	2,339	565	2,903	1,821	1,082	4,070	379	432
3,500	4,600	1,981	1,184	3,166	2,213	953	5,088	473	540
3,015	3,620	2,339	–	2,339	2,035	304	7,950	740	843
3,500	4,600	1,981	833	2,864	2,713	151	10,600	986	1,124
998	1,198	516	-	516	571	(55)	1,400	130	149
998	1,198	516		516	695	(179)	1,400	130	149

System Design

The following summary is the recommended plan of operation for the Golden Gate Commuter Ferryboat System. This plan is offered after testing all of the vessel candidates against service requirements.

Sausalito/Mill Valley-San Francisco Service: System VII a (Southern Marin Service)
Two Golden Gate Class vessels operating 3,847 hours/year each Weekdays: 11 hours/day-20 round trips/day.
Weekends and holidays: 10 hours/day—18 round trips/day 30 minute intervals—30 minute block time.
Fares: 50¢ one way, $1.00 round trip.

The Sausalito/Mill Valley market is the smallest to be served and a deficit operation is forecast. All things being considered, the M. V. Golden Gate Class vessels offer the lowest operating costs of all candidates studied, (see Supplement I), yet has the ability to fulfill all of the service requirements. The vessels are considered to have acceptable passenger accomodations. Traffic projections are shown to have an annual increase of 5% per year for the next ten years.

Corte Madera Creek-San Francisco: System I-b (Central Marin Service).

Five Spaulding-165 Class vessels: 3 operating 5,082 hours/year providing regular service and 2 operating 3,847 hours/year providing supplemental service.

Regular service:
Weekdays 16 hours/day—30 round trips/day.
Weekends & holidays 10 hours/day—18 round trips/day.
30 minute intervals—40 minute block time.

Supplemental service:
Weekdays: 11 hours/day—3 round trips during the morning commuter period and 3 round trips during the evening commuter period. Bay Circle cruises during mid-day.

Weekends and holidays: 10 hours/day—continuous Bay Circle Cruise service.

Fares: Regular & commuter service 50¢ one way, $1.00 round trip, Bay Circle Cruises $2.00.

The 1½ hour Bay Circle Cruise or omnibus service from San Francisco would stop at Sausalito, Tiburon, Corte Madera Creek and return with stop-over and transfer privileges to following ferryboats or to the optimum bus system.
Other uses of the vessels in supplemental and recreational service would be possible such as a 2 hour cruise including a trip under the Golden Gate Bridge, a stop at Fisherman's Wharf,a stop at Angel Island or many of the other points of interest on the Bay. The 2 hour cruise would be provided at a fare of $2.50 per person. The system revenue and cost analysis has included only the Bay Circuit Cruise at $2.00 per passenger however. Supplemental or recreational service could be modified to meet the highest passenger or tourist demand after service has been inaugurated.

The Spaulding-165 class vessels were designed specifically for the Corte Madera Creek-San Francisco (Central Marin) service and answer all of the service demands. The vessel's speed is sufficient to give a favorable transit time and acceptable frequency of service. Gas turbine propulsion was selected because of its low weight to horsepower ratio, its clean exhaust, low noise level and vibration free operation. Aluminum construction was selected to reduce displacement in order to develop the 25 knot speed characteristic required by the service. Traffic projections are shown to have an annual increase of 8% per year for the next ten years.

Corte Madera Creek-San Francisco Service: System II b (Central Marin Service).

The following two step program is offered for consideration as an alternate and is a highly feasible plan to start Central Marin operations:

- Initiate the service by constructing three Spaulding-165 class vessels and operate them in regular service as follows:

  Weekdays 16 hours/day: 30 round trips/day
  Weekends and holidays: 11 hours/day—18 round trips/day
  Fares: 50¢ one way, $1.00 round trip.

- When commuter traffic projections indicate a sufficient demand two Boeing 929-110 hydrofoils can be purchased for supplemental service operating as follows:

  Weekdays: 11 hours/day—5 round trips in morning commuter period and 5 round trips during the evening commuter period and Bay Circle Cruises during mid-day.

  Weekends and holidays: 10 hours/day—continuous Bay Circle Cruise service.

  Fares: Commuter service 50¢ one way, $1.00 round trip Bay Circle Cruise $3.50/passenger.

The Boeing hydrofoils would have excellent passenger appeal. They would also provide an outstanding tourist attraction as they have offshore capabilities and can operate beyond the Golden Gate Bridge.

Revenues and Vessel Operation Costs — Recommended Systems

Year	Systems	Number Vessels	Commuters Weekdays	Commuter + Non-Commuters	Regular Service Revenue in $000's	Supplemental Service Revenue in $000's	Total Revenue in $000's	Vessel D.O.C. in $000's	Terminal Expense in $000's	Gross Profit from Operations in $000's	Administration Overhead in $000's	Net * Income in $000's	Income Per * Computer in $000's
1972	Ib	5	4,171	5,488	$2,364	$1,932	$4,296	$3,408	$ –	$ –	$ –	$ –	$ –
	VIIa a	2	998	1,198	516	–	516	571	–	–	–	–	–
	Total	**7**	**5,169**	**6,686**	**$2,880**	**$1,932**	**$4,812**	**$3,979**	**$ 324**	**$ 509**	**$ 251**	**$ 258**	**$ 49.91**
1973	Ib	5	4,504	5,927	$2,553	$2,125	$4,678	$3,532	$ –	$ –	$ –	$ –	$ –
	VIIa	2	1,047	1,257	541	–	541	602	–	–	–	–	–
	Total	**7**	**5,551**	**7,184**	**$3,094**	**$2,125**	**$5,219**	**$4,134**	**$ 340**	**$ 745**	**$ 263**	**$ 482**	**$ 86.83**
1974	Ib	5	4,865	6,401	$2,757	$2,337	$5,094	$3,662	$ –	$ –	$ –	$ –	$ –
	VIIa	2	1,100	1,320	568	–	568	636	–	–	–	–	–
	Total	**7**	**5,965**	**7,721**	**$3,325**	**$2,337**	**$5,662**	**$4,298**	**$ 357**	**$1,007**	**$ 276**	**$ 731**	**$122.55**
1975	Ib	6	5,254	6,913	$2,977	$2,571	$5,548	$4,556	$ –	$ –	$ –	$ –	$ –
	VIIa	2	1,155	1,386	597	–	597	671	–	–	–	–	–
	Total	**8**	**6,409**	**8,299**	**$3,574**	**$2,571**	**$6,145**	**$5,227**	**$ 375**	**$ 543**	**$ 290**	**$ 253**	**$ 39.48**
1976	Ib	6	5,674	7,466	$3,216	$2,828	$6,044	$4,723	$ –	$ –	$ –	$ –	$ –
	VIIa	2	1,213	1,456	627	–	627	708	–	–	–	–	–
	Total	**8**	**6,887**	**8,922**	**$3,843**	**$2,828**	**$6,671**	**$5,431**	**$ 393**	**$ 847**	**$ 305**	**$ 542**	**$ 78.70**
1977	Ib	7	6,128	8,063	$3,473	$3,111	$6,584	$5,712	$ –	$ –	$ –	$ –	$ –
	VIIa	2	1,273	1,558	671	–	671	747	–	–	–	–	–
	Total	**9**	**7,401**	**9,621**	**$4,144**	**$3,111**	**$7,255**	**$6,459**	**$ 413**	**$ 383**	**$ 320**	**$ 63**	**$ 8.51**
1978	Ib	7	6,618	8,708	$3,751	$3,422	$7,173	$5,921	$ –	$ –	$ –	$ –	$ –
	VIIa	2	1,337	1,605	691	–	691	789	–	–	–	–	–
	Total	**9**	**7,955**	**10,313**	**$4,442**	**$3,422**	**$7,864**	**$6,710**	**$ 434**	**$ 720**	**$ 336**	**$ 384**	**$ 48.27**
1979	Ib	8	7,148	9,405	$4,051	$3,764	$7,815	$7,015	$ –	$ –	$ –	$ –	$ –
	VIIa	2	1,404	1,685	$ 726	–	726	832	–	–	–	–	–
	Total	**10**	**8,552**	**11,090**	**$4,777**	**$3,764**	**$8,541**	**$7,847**	**$ 455**	**$ 239**	**$ 353**	**$ -114**	**$ -13.33**
1980	Ib	8	7,720	10,157	$4,375	$4,141	$8,516	$7,272	$ –	$ –	$ –	$ –	$ –
	VIIa	2	1,474	1,769	762	–	762	878	–	–	–	–	–
	Total	**10**	**9,194**	**11,926**	**$5,137**	**$4,141**	**$9,278**	**$8,150**	**$ 478**	**$ 650**	**$ 370**	**$ 280**	**$ 30.46**

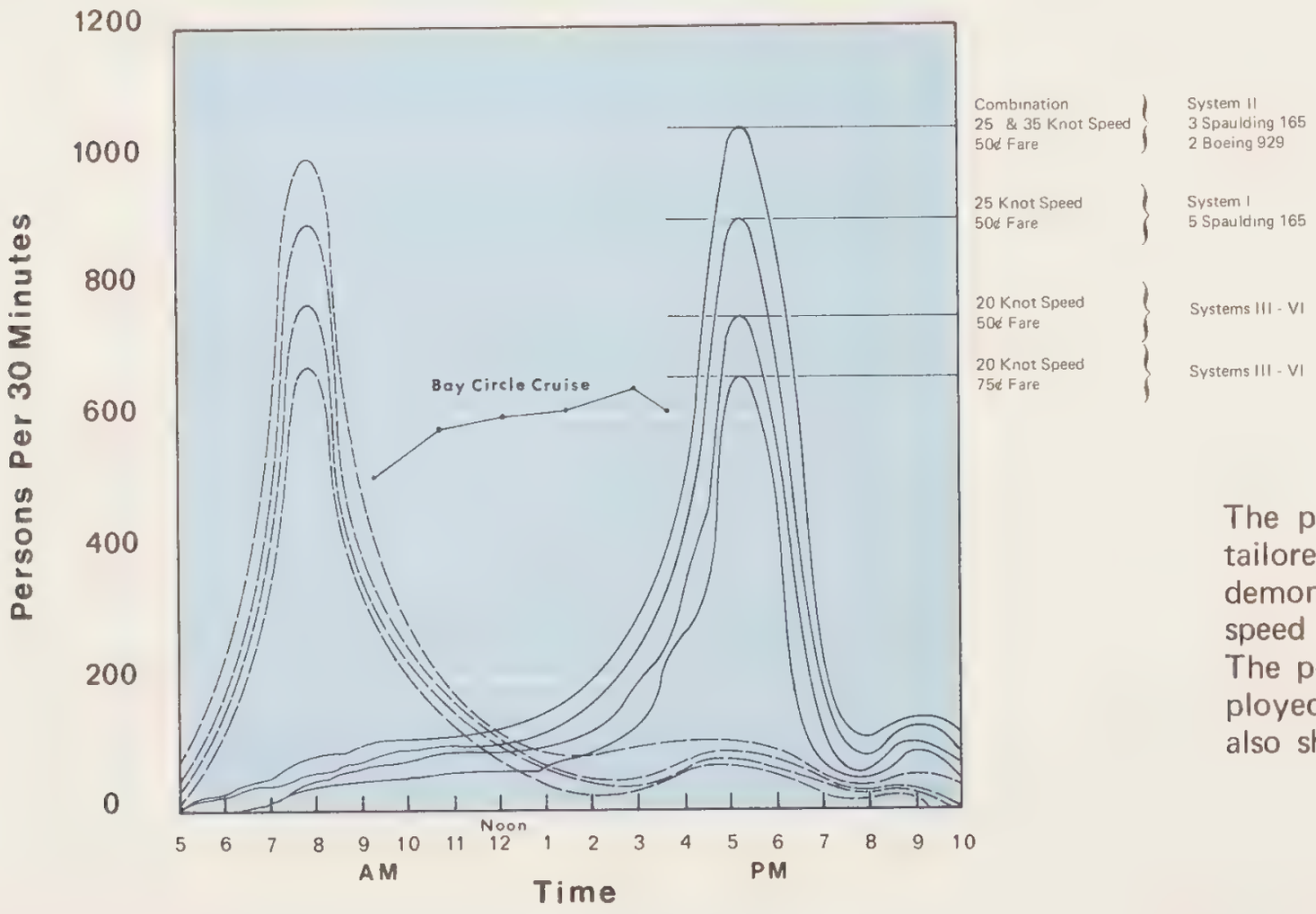
* Exclusive of Financial Charges

Financing: System Ib and VIIa

Year	Spaulding 165	M.V. Golden Gate	Investment Vessels in $000's	Investment Dredging & Floats in $000's	Investment Terminals in $000's	Total Capital Investment in $000's	Finance Cost @ 7.0% in $000's	Finance Cost @ 8.75% in $000's	Annual Subsidy @ 7.0% in $000's	Annual Subsidy @ 8.75% in $000's	Sub/per Commuter @ 7.0% in $000's	Sub/per Commuter @ 8.75% in $000's
1972	5	2	$11,900	$3,031	$2,214	$17,145	$1,595	$1,818	$1,337	$1,560	$258.79	$301.94
1973	5	2		–	–	17,145	1,595	1,818	1,113	1,336	200.50	240.68
1974	5	2		–	–	17,145	1,595	1,818	864	1,087	144.84	182.23
1975	6	2	2,431	–	–	19,576	1,821	2,076	1,568	1,823	244.66	284.44
1976	6	2		–	–	19,576	1,821	2,076	1,279	1,534	185.71	222.74
1977	7	2	2,680	–	–	22,256	2,071	2,360	2,008	2,297	271.31	310.36
1978	7	2		–	–	22,256	2,071	2,360	1,687	1,976	212.07	248.40
1979	8	2	2,995	–	–	25,251	2,349	2,677	2,463	2,791	288.00	326.36
1980	8	2		–	–	25,251	2,349	2,677	2,069	2,397	225.04	260.71

Corte Maderia — San Francisco Service

Effect of speed and fares on commuter traffic and off peak Bay Circle Cruise potential.



The proposed ferryboat system provides a tailored service for commuters. The graph demonstrates the effect of both ferryboat speed and fare changes on commuter traffic. The potential use of off-peak capacity employed in the Bay Circle Cruise service is also shown.

Capital Investment & Debt Service Summary

Recommended Corte Madera and Sausalito Service
(100% Borrowed Capital for 20 Yrs.)

	Capital Investment	8.75% Annual Debt Service	7.0% Annual Debt Service
Vessels			
5 Spaulding-165 Class	$10,500,000		
1 Golden Gate Class	700,000		
1 M.V. Golden Gate	700,000		
Total	**11,900,000**	$1,261,940	$1,107,127
Dredging & Floats			
Corte Madera Creek	$ 1,905,000		
Tiburon	270,000		
Sausalito	270,000		
San Francisco	586,000		
Total	**3,031,000**	321,423	281,992
On-Shore Terminals[1]/			
Corte Madera Creek			
Concrete Pier	$ 634,000		
Terminal Building	300,000		
Parking Area	175,000		
Warehouse & Shops	105,000		
Hydraulic Fill	350,000		
Total	**1,564,000**	165,855	145,508
Tiburon			
Concrete Pier	$ 350,000		
Miscellaneous	50,000		
Total	**400,000**	42,418	37,214
San Francisco[2]/			
Waiting Areas	$ 200,000		
Miscellaneous	50,000		
Total	**250,000**	26,511	23,259
Total Investment	**$17,145,000**		
Total Debt Service @ 8.75%		**$1,818,147**	
Total Debt Service @ 7.0%			$1,595,100

1/ On-Shore Terminal cost estimates are provided for the convenience of the Bridge District. These estimates are beyond the scope of this study but are included to determine the overall cost of the system. Estimates do not include the cost of land acquisition or leasing.

2/ San Francisco terminal estimate assumes that the cost of pier is part of BARTD project and not chargable to the ferryboat project. It assumes also that other Ferry Building Terminal improvements will be borne by those redeveloping the Ferry Building complex.

Profit & Loss Statement

Central Marin County Service—System Ib
Southern Marin County Service—System VIIa
1st Year of Operation (1972)

Revenue:		
Central Marin Service	$2,363,651	
Bay Circle Cruises	1,931,507	
Southern Marin Service	515,975	
Total Revenue		$4,811,133
Cost of Services:		
Vessel Expense		
Central Marin Service and Bay Circle Cruises	3,407,860	
Southern Marin Service	571,341	
Terminal Expense	323,574	
Total Cost of Services		4,302,775
Gross Profit From Operations		**$508,358**
Administrative Expenses:		
General Administrative Overhead		250,975
Net Income (Without Financing Expense)		**257,383**

Financing:	**@7.0**	**@8.75**
System Ib	$ 976,878	$1,113,476
System VIIa	130,250	148,463
Dredging & Floats	281,992	321,423
Onshore Terminals	205,981	234,784
Total	1,595,101	1,818,140
Net Income	257,383	257,383
Annual Subsidy	1,337,718	1,560,763
Commuters		
System Ib	4,171	
System VIIa	998	
Total	5,169	
Annual Subsidy Per Commuter	$ 258.66	$ 301.80

Annual Terminal Expense

Due to the comparatively low level of projected commuter service from Sausalito, two vessels of the Golden Gate Class will adequately handle the peak commuter loads and give half hour service. We have shown two terminals in our estimated construction costs, one located at South Sausalito and the other at North Sausalito. It is our opinion that only one terminal should be constructed. If at all possible, through negotiations with the City of Sausalito, a more centrally located terminal site should be selected which would not be exposed as the South Sausalito terminal nor require the long run to open water in a restricted and congested channel as required by the North Sausalito terminal.

Initially, terminals will be constructed only in the following locations for the following cost: (See page 45)

Tiburon	$ 270,000.
Sausalito	270,000.
Corte Madera	1,905,000.
Ferry Building	586,000.
	$3,031,000.

For Sausalito we anticipate that no terminal personnel will be required. The operation would be similar to that provided when the "Bridge" operated the M.V. "Harbor Emperor". The deck hands would handle the mooring lines, the gangways and ticket sales.

For the Bay Circle Cruise during midday, the 165 foot vessels will call both at Sausalito and Tiburon. As the schedule for this service is more relaxed, we have considered that the deckhands would handle the mooring lines and ticket sales. The gangways are an integral part of the vessel and are hydraulically operated which will simplify the landing procedure. No terminal personnel have been considered at Tiburon.

The high density Corte Madera/Larkspur commuter traffic demands a 15-minute schedule during the morning and evening commuter period. Dispatch is highly important, therefore we have allowed for one ticket salesman and two line handlers per shift at the Corte Madera/Larkspur terminal complex. A similar situation exists at the Ferry Building in San Francisco, therefore we have made the same allowance for this terminal. The line handlers would also act as "ticket takers". The ticket salesmen and line handlers would be members of the Inlandboatmen's Union and would work a 40 hour week with a "relief crew" on weekends and holidays similar to the deckhands on the vessels. Wages and allowances have been projected at the same level as Class II deckhands.

Terminal Expense (continued)

1. **Terminal Personnel**

Regular Crew (Corte Madera/Larkspur & San Francisco)

	Cost/Year	
6 Ticket Takers/Line Handlers @ $850/month	$ 61,200	
Overtime @ 10%	6,120	
Annual Wages/Shift	$ 67,320	
Basic Crew works 2,000 hours/year		
$67,320 / 2,000 = $33.66/hour -or- $1,346/40-hr week		
Wages		
Basic Annual Wage "Regular Crew"		
2 x $67,320		$134,640
Basic Annual Wage "Relief Crew"		
Weekends (10-hour day)		
Straight Time		
104 days x 8 hrs @ $33.66/man	$ 28,005	
Overtime		
104 days x 2 hrs @ $50.49/man	10,502	
Holidays		
9 days x 10 hrs @ $50.49/man	4,544	43,051
Total Annual Terminal Personnel Wages		$177,691

Allowances:
As the "relief crew" works a sufficient number of hours to entitle it to the full benefit of all allowances, we have considered three full terminal crews or a total of 18 men receiving the following benefits:

Health & Welfare		
$100/month/man	$ 21,600	
Pension		
$45/month/man	9,720	
Uniform Allowance		
$110/year/man	1,980	
Vacation		
3 crews @ 2 weeks/crew		
3 x 2 x $1,346	8,076	41,376
Payroll Taxes:		
FICA		
5.0% x 18 x $7,800	$ 7,020	
Unemployment (Calif. State)		
3.5% x 18 x $3,800	2,394	9,414
Total Annual Terminal Personnel Cost		$228,481

2. **Terminal Maintenance & Repair**

@ 2.5 x $3,031,000	$ 75,775

3. **Other Terminal Expense**

Janitorial Expense			
2 @ $150/month x 12			$ 3,600
Electricity & Water			
2 @ $100 x 12		$ 2,400	
2 @ $150 x 12		3,600	6,000
Insurance & Bonds			
Fire			
2 @ $500/yr	$1,000		
2 @ $1000/yr	2,000	$ 3,000	
P&I			
4 @ $1000		4,000	
Personal Injury			
4 @ $500		2,000	9,000
Communications			
Telephones			
2 @ $30/mo	720		19,320
(A) Annual Termainal Operating Expense			**$323,576**

4. **Terminal Financing**

Debt service 8¾% for 20 years on	
Capital Investment of $3,031,000	$321,423
Operating Expense (A)	323,576
(B) Total Annual Terminal Expense including Financing	**$644,999**

General and Administrative Overhead

A. Administrative Personnel

Classification	Annual Wage
1 General Manager	$ 25,000.
1 Marine Superintendent	20,000.
1 Port Engineer	18,000.
1 Comptroller	18,000.
2 Secretaries @ $750.00	18,000.
3 Clerk Typists @ $650.00	23,400.
	$122,400.
Wage Benefits including Vacations, Pensions, FICA, etc. (+25%)	30,600.
Total Administrative Personnel	**$153,000.**

B. Other Office Expenses

Administrative Office Rental @ $1,000.00/mo.		$12,000.	
Electricity & Water		1,500.	
Communications			
Telephone	$ 2,500.		
Postage	1,000.		
Radio/Telephone	10,000.		
		13,500.	
Janitorial Service		2,400.	
Insurance-Bonds		2,500.	
Printing & Supplies			
Supplies	$1,000.		
Tickets	4,000.		
Schedules	2,000.		
		7,000.	
Vehicle Rental & Operation 4 @ $150.00/mo.		$ 7,200.	
Office Furniture & Fixtures Capital Investment, $15,000. Depreciation @ 8%/Yr. average		1,875.	
			$ 47,975.
C. Promotion & Advertising			**50,000.**
			97,975.
Total Annual Administrative Office Expense			**$250,975.**

Financing The System

Cost of Borrowed Capital

In this study, the system was assumed fully financed on borrowed capital at 8.75% interest to be repaid in twenty years. This procedure provided additional conservatism to the estimates. The Bridge District's cost of capital to underwrite the proposed ferryboat system could be considerably less. Some estimate that a more realistic capital cost interest rate would be 7%, others say less.

Recommended System		$17,150,000
Finance cost @ 8.75%	=	$ 1,818,147
@ 7.0%	=	1,595,100
Difference	=	$ 223,047

Terminals

With reference to financing the several terminals proposed for the system, it is possible that those interests who will be developing the area and facilities might well include the cost of redeveloping the Ferry Building terminal complex except for providing the passenger boarding floats.

Marin communities might provide terminals to the ferryboat system in return for the benefits received from the ferryboat operation; or, terminals might be provided by either municipalities or private interest and leased to the ferryboat system.

Dredging

The cost of dredging, especially at Corte Madera Creek and Gallinas Creek might be shared by the U. S. Corp of Engineers.

Organization

A non-profit corporation under a joint powers agreement could be formed for financing purposes.

Federal Aid

Fifty to sixty-six percent of the funding might be covered by the U. S. Department of Transportation for a demonstration project.

Phasing

Based upon the foregoing, the proposed Golden Gate Ferryboat System could be phased into operation on the following schedule:

Phase I

August 1970 - Commence operation between Sausalito & San Francisco; M. V. Golden Gate.
September 1970 - Apply for Federal Aid; begin negotiations for acquiring terminal sites.

Phase II

September 1970 - Selection of naval and terminal architects.
September/December 1970 - Vessel and terminal contract designs.
January/February 1971 - Call for bids and select shipbuilder and terminal builder.

Phase III

1971-72 Vessel construction
1971-72 Terminal construction and development

Phase IV

1972 Opening of Corte Madera Creek to San Francisco service.
1978 Opening of Gallinas Creek to San Francisco service.

Conclusions

And Recommendations

Conclusions and Recommendations

Conclusions

Two significant markets exist for the Golden Gate Commuter Ferryboat System on San Francisco Bay: for weekday commuter service and for off-peak and weekend tourist and recreation service. Traffic projections for this modern ferryboat service are based primarily on commuters destined within easy walking distance of the San Francisco Ferry Building and are considered conservative. This primary market will expand faster than projected as the development of Downtown San Francisco continues and when BART commences operations on Market Street from the Embarcadero Station to the Civic Center and beyond.

Commuter ferryboat service by itself would require an operating subsidy. By employing the excess off-peak and weekend ferryboat capacity to take advantage of the large tourist and recreation market, commuter service deficits can be minimized. Traffic forecasts for the Bay Circle Cruise service are believed reasonable and can be verified or modified by analysis of the recreational data currently being accumulated by the Bridge staff.

The recommended system incorporates all requirements necessary to attract significant numbers of highway commuters during weekdays and people seeking recreation during off-peak hours and on weekends. The system is readily integrated with other transport modes into a balanced transportation system. Selected terminal sites provide for easy access, convenient parking and transfer facilities for feeder systems at both ends.

Designed principally for commuters to Downtown San Francisco, the Ferryboat System cannot efficiently serve all Marin County commuters to San Francisco. Service for commuters to West San Francisco can best be provided by the Optimum Bus System serving areas other than Downtown San Francisco. It is assumed that Optimum Buses will provide feeder service to Marin County ferryboat terminals and other intra-county services.

The Spaulding 165 ferryboat is considered the optimum ferryboat design for the Corte Madera Creek to San Francisco route and for the Bay Circle Cruise service. The attractiveness, passenger capacity, speed capabilities and reliability of this vessel design provide the foundation for the feasibility of the Golden Gate Ferryboat System. The Boeing 929 hydrofoil is considered the optimum vessel design for the Gallinas Creek route and a modified Golden Gate Class for the Sausalito route, both for similar reasons.

Benefits

The Golden Gate Commuter Ferryboat System would divert between 5,200 and 5,800 morning and afternoon commuters per weekday during its first year of operation (1972) reducing the Bridge commuter vehicle peaks by at least 2,600 to 2,900 private automobiles every weekday. The cost/benefit ratio of this reduction is extremely favorable when compared with the projected costs for a second bridge deck, rail transit or other proposals.

The system would reinforce the bay and ocean as a force in the community lives of San Francisco and the Counties to the north, enhancing the image of these areas for both residents and visitors. The ferryboat system would not only reinforce the present water oriented communities of San Rafael, Tiburon, Belvedere, and Sausalito, but would create opportunities for totally new water oriented communities or developments at Gallinas Valley, Larkspur, Corte Madera and elsewhere. Greater access and enjoyment of the Bay and nearby ocean for both resident and visitor would be restored.

Recommendations

The Golden Gate Commuter Ferryboat System should be implemented as outlined in this study. Negotiations for financing the system should commence immediately. Contracts for vessels and terminal construction plans should be let within the shortest possible time. Procurement and development of the recommended terminal sites should have highest priority. These immediate actions must be taken to assure meeting the phasing dates for making modern ferryboats an integral part of a balanced transportation system serving the Golden Gate Corridor.

Acknowledgements

A number of individuals have made valuable and significant contributions to this study. Appreciation is expressed by acknowledgement of their organizations.

Regional and State:
Golden Gate Bridge, Highway & Transportation District
San Francisco Bay Conservation and Development Commission
Bay Area Transportation Study Commission
California State Division of Highways

City and County of San Francisco:
Office of The Mayor
Department of Planning
Port of San Francisco
Redevelopment Agency

Marin County:
Board of Supervisors
Planning Department
Balanced Transportation Program
Transit District
Public Works, Flood Control

City Governments:
San Rafael
Larkspur
Corte Madera
Mill Valley
Tiburon
Sausalito

United State Government:
Department of Transportation
Urban Mass Transit
Coast Guard
Corp of Army Engineers
Coast and Geodetic Survey

Civic Organizations:
Greater San Francisco Chamber of Commerce
Marin County Chamber of Commerce and Visitors Bureau
Redwood Empire Association

Transportation Companies:
Marin County Transit Systems
San Francisco Municipal Railway
Western Greyhound Lines

Maritime Unions:
Inland Boatmen's Union of the Pacific
Marine Engineer's Beneficial Association
Masters, Mates and Pilots Union

Consultants:
Arthur J. Giddings
Arthur D. Little, Inc.
Walter Landor and Associates
Thomas T. Lunde, Inc.
Kaiser Engineers, Inc.
Peat, Marwick, Mitchell & Company
Rogers, Slade and Hill, Inc.

Technical Sources:
Bell Aerospace Company
Boeing Company, Marine Product Development
Blount Marine Corporation
George Engine Company
Hydrodyne Marine Corporation
Hydro-Ski International Corporation
Kawasaki Heavy Industries, Limited
Martinolich Shipbuilding Corporation
Pacific Hydrofoil Lines, Inc.
Supramar Limited
Transportation Technology, Inc.
Vosper Thornycroft Group

Credits:

Golden Gate Bridge and Highway District 11, 82
Sunderland Aerial Photographs 19
Western Electronic News 21
Northern Waterfront Plan - John S. Bolles 38, 39
Schaefer Marine 75

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Technical Writing Assistance: Michael R. Speer

Report design, charts, maps, drawings and paste-up were done in the firms graphic department; director Sigmund R. Derror, assistance Gary D. Olsen.

Typography: Computer Graphics Division of Data Planning Corp.

Type Face: Univers, Helvetica Bold, and Caslon Bold Condensed.

Paper: Strathmore Rhododendron Basis 65-130

Printing: Forward Press

Binding: Bayless Bindery

OUTLINE SPECIFICATIONS

1. CONSTRUCTION

a. Structure

The hull will be single chine, vee bottom construction with adequate flare forward. The vessel will be transversely framed with a full double bottom fitted extending from frame 15 to frame 63. The superstructure will be longitudinally framed over transverse web frames spaced at 6'-0" centers. Suitable foundations for main engines, auxiliaries and deck machinery will be provided.

Aluminum has been selected for the primary structure of the vessel. Steel will be used in certain locations to suit U. S. Coast Guard fire regulations. Weight saving is of greatest importance in order to guarantee high vessel performance.

All welding of the primary structure will be by the Inert-Gas-Shielded Metal-Arc (MIG) process. Great attention will be given to joining the aluminum structure to the steel structure in order to prevent corrosion.

b. Rudders

Two semi-balanced rudders will be provided, one behind each screw. Rudders will be stainless steel double plate construction and streamline shaped. Rudder stocks will be solid stainless steel forming an integral part of the rudder structure. Rudder tubes will be heavy aluminum tubing with nylon bearings.

2. INTERIOR BULKHEADS

Fire enclosure bulkheads, toilet fan rooms and other spaces will be either steel or aluminum to suit U. S. Coast Guard fire requirements. Joiner bulkheads will be Johns Manville "Marinite 36" with suitable finish.

3. DOORS, HATCHES AND MANHOLES

a. Doors

Doors will be constructed, finished and installed to suit their particular enclosures and purposes as indicated on the plans.

All doors will meet U. S. Coast Guard requirements. Side port closures will form the passenger gangway and will be hydraulically operated.

b. Hatches

Raised quick acting watertight hatches will be provided as shown. W. T. hatches over main propulsion machinery will be provided with quick acting dogs to facilitate easy removal for servicing the main engines.

c. Manholes

Manholes will be 18" diameter, aluminum standard positive locking as manufactured by L. S. Baier & Associates.

4. HULL FITTINGS

a. Windows

Windows will be located as shown in plans and will be 3/8" and 1/4" safety plate. Windows will have suitable metal frames. All outboard side windows will be fixed. Drop sash windows in the wheelhouse shall be Kearfott or equal.

b. Stairways and Ladders

All stairways and ladders will comply with U. S. Coast Guard requirements.

c. Rails

Rails shall be located as shown and for the most part will be 4-course with 2-1/2 inch Schedule 80 pipe top rail flattened to an oval. Interior railings, storm rails, etc., shall all meet the requirements of the U. S. Coast Guard.

d. Mooring Fittings

Will be provided as shown and such additional fittings will be provided as necessary.

5. DECK COVERING

a. Passenger Areas	- Wool Carpeting
b. Toilet Spaces	- Ceramic Tile
c. Weather decks	- Nonskid paint
d. Wheelhouse & Service Areas	- Vinyl Asbestos Tile
e. Fan Rooms, Lockers, etc.	- Bare and Painted
f. Machinery Spaces	- 3/16" Aluminum Diamond Deck Plate

6. INSULATION AND LININGS

a. Insulation

All materials are to be incombustible. All exposed overheads and exposed superstructure bulkheads and side shell will be insulated. Interior bulkheads will be insulated to suit fire resistant requirements. Acoustic insulation will be provided when necessary.

b. Linings and Ceilings

All exposed bulkhead and side shell insulation will be lined with Johns-Manville "Marinite 65" 1/2 inch thick. Ceilings in way of insulation will be light gage sheet steel formed for stiffness with a baked enamel finish. Ceilings elsewhere will be aluminum formed in a similar pattern to the steel with a similar baked enamel finish. The exposed surface of the Marinite throughout will have a hard surface material such as formica applied. The entire installation will suit U. S. Coast Guard requirements.

7. GROUND TACKLE

a. Anchor and Cable

One 500 pound galvanized Danforth anchor will be provided and stowed in a hawse pipe/anchor pocket as shown. A short length of galvanized chain shall be led to a chain stopper. Anchor cable shall be 105 fathoms of 2 inch diameter polypropylene rope.

b. Hawsers and Warps

A complete outfit of hawswers and works will be provided.

8. VENTILATION

A forced air ventilation system will be provided for passenger comfort. The system will provide for a complete air change every two minutes. Electric duct heaters will be provide to take the chill off the air during winter operation.

The gas turbine inlet air shall be provided by a watertight duct leading from the funnel and installed to provide an airlift to exclude water.

9. FIRE EXTINGUISHING SYSTEMS

The vessel will be provided with a complete firemain system which will be supplied sea water from the fire pump. The main and auxiliary engine room will be fitted for automatic CO_2 flooding. A smoke and heat detecting alarm system together with the necessary portable fire extinguishers will be provided all in accordance with U. S. Coast Guard requirements.

10. PAINTING AND CEMENTING

a. Exterior Below Waterline

(1) Brush blast to provide an anchor for paint.

(2) One coat vinyl prep-bond.

(3) One coat vinyl anticorrosive.

(4) Two coats vinyl antifouling.

b. Entire Exterior above Waterline

(1) Brush blast to provide an anchor for paint.

(2) One coat vinyl prep-bond.

(3) One coat vinyl anticorrosive.

(4) Two coats vinyl color to owner's choice.

c. Void spaces and service spaces not exposed to passenger view -- unpainted.

d. Machinery spaces - unpainted.

e. Passenger spaces - - All exposed bulkheads and deckheads not covered with a permanent finish or hard surface material will be primed and color coated to suit surroundings. The highest grade of commercial paint will be used.

11. NAVIGATING EQUIPMENT

a. Magnetic compass 8"

b. Fog Bell of Polished Brass 10"

c. Dual air horn with whistle light

d. Navigation lights located as shown on the outboard profile and as approved by the U. S. Coast Guard

e. Navigation clocks - 5"

f. Clinometer pendulum type

g. Barometer 5" (matching navigation clock)

h. Two 14" incandescent searchlights

i. Necessary floodlights for line handling, boarding stations, lifefloat and Rescue Boat operations.

12. LIFESAVING EQUIPMENT

a. Rescue Boat and Davit

A 14'-0" rescue boat will be provided and installed as shown stowed in a pipe cradle. A davit will be installed together with winch and gear to properly handle the rescue boat, all as approved by the U. S. Coast Guard.

b. Miscellaneous Lifesaving Equipment

Life preservers, life rings, liferafts, life floats, etc., will all be provided and stowed in accordance with the U. S. Coast Guard requirements.

13. FURNITURE AND FURNISHINGS

Passenger spaces will be arranged in accordance with the deck arrangement plans and will comply with the requirements of the U. S. Coast Guard and the U. S. Public Health Service. Furniture shall be incombustible and shall all be upholstered. Polyfoam upholstery will be polyurethane foam of proper density. Naugahyde covering will be of superior weight and will be fire resistant.

a. Reclining Lounge Chairs

Reclining lounge chairs will be of rugged construction upholstered and will have a minimum seat width of 20 inches or 22 inch spacing centerline of arm rest to arm rest. The pitch of the chairs will be 36 inches. Fixed upholstered arm rests with built-in ash trays will be installed.

b. Cocktail Lounge Settee

Framing and case work will be aluminum prefinished where exposed. Upholstery will be fire-resistant polyfoam with naugahyde covering.

c. Casual Chairs

Casual chairs will be of rugged construction upholstered and will have a minimum seat width of 16 inches.

d. Tables

Tables will be of incombustible construction with Formica laminate tops and edges. Single pedestal base will be sturdy and broad enough to permit moving tables without destroying their stability.

e. Cocktail and Snack Bar

The bar shall be of fireproof construction with Formica counter top and stainless steel sinks, cabinets and ice maker. Stowage will be provided for portable equipment. The back bar will be fitted for stowage of liquor bottles. Provision shall be made for coffee and light breakfast service in the morning and liquor and snack service in the evening.

f. Interior Decoration

Services of an interior decorator will be provided to assure that the interior items will be crisp and modern in design and reflect the quality and taste found in modern aircraft.

14. SANITARY FIXTURES

Public toilet spaces will be provided as shown and the fixtures, trimmings and accessories will be of high quality marine type. All fixtures, mirrors, towel dispensers, etc., shall be equivalent in arrangement and design to the most modern high quality restaurant.

15. HARDWARE

All hardware will be of best marine quality.

16. MACHINERY

The main and auxiliary engine room will be unmanned with all controls for starting, stopping, speed and direction control located in the wheelhouse. Speed and direction control will also be provided at the bridge wings.

a. Gas Turbines

Main propulsion drive will be by two gas turbines of 2500 SHP each. The gas turbines will burn diesel fuel.

b. Strut Drive

Each turbine will be attached to a Hydro Drive strut drive unit. These units will contain the controllable pitch propeller and drive gearing assembly.

17. PUMPS

All pumps will be of a high grade commercial standard, designed for reliability and economy in the service intended. Each motor driven pump will be furnished with a marine type motor, flexible coupling if not a close coupled unit and mounted on a common base. Pumps will be sized to suit the service intended.

18. PIPING SYSTEMS

All piping systems will be as required by the U. S. Coast Guard.

Fuel oil will be carried in two deep tanks forward. Tanks will be properly vented and provision will be made for rapid and easy filling to minimize servicing time.

Fresh water will be carried in two 750 gallon aluminum tanks. One 40 gallon hot water heater will supply hot water to the lavatories and bar. Tanks will be fitted with proper vents and overflows and provision will be made for rapid and easy filling to minimize servicing time.

19. SHIPS SERVICE GENERATORS

Electrical power will be supplied by two 60 KW 450 Volt 3Ø 60 Cycle diesel generators. The generators will be arranged so that either generator will serve as the "on line" generator and the other to serve as a "standby". The "standby" generator will start automatically on failure of the "on line" generator. The generators will be started and stopped from the wheelhouse control station.

20. DECK MACHINERY

a. Steering Gear

The vessel shall be fitted with an electro-hydraulic steering gear designed to meet the requirements of the American Bureau of Shipping and the U.S. Coast Guard. The steering system shall be Sperry Marine Systems, Matthews Hydraulics, or equal. The system will have two pump/motor units one to act as a "standby" for the other. Three steering stations will be provided, one in the wheelhouse and one at each bridge wing.

b. Anchor Windlass and Capstan

One 10 HP vertical electrically driven combination anchor windlass and capstan capable of lifting a 500 pound anchor will be fitted forward as shown on the plans.

21. LIGHTING SYSTEMS

All fixtures will bear the Underwriters Laboratories marine label and will be suitable for the intended use.

a. Lighting Fixtures - Interior

(1) Main Deck

(a) Forward Passenger Lounge :

Two lamp-four foot-flush mounted fluorescent units in sufficient number to provide illumination for comfortable reading.

(b) Snack Bar and Cocktail Lounge:

Ceiling mounted "can" type with 75 watt lamps sufficient in number to give illumination for comfortable reading. Dimmer switch will be located near the bar.

(2) Upper Deck

(a) Observation Lounge Entrance Lobby and Passenger Lounge

Two lamp-four foot-flush mounted fluorescent units in sufficient number to provide illumination for comfortable reading. Observation lounge will be fitted with blackout curtains.

(3) Toilet Spaces

One 15 watt fluorescent mirror light over each mirror together with the necessary ceiling fixtures will be installed.

(4) Engine rooms, fan rooms, service spaces, etc.

Lighting to suit.

b. Lighting Fixtures - Exterior

Bulkhead mounted 60 watt watertight globe and guard fixtures as necessary to give proper open deck illumination.

c. Exit Fixture

As required by the U. S. Coast Guard. Mount from the overhead.

d. Emergency Lighting Fixtures

Square flush mounted 100 watt incandescent light units located to suit U. S. Coast Guard.

22. ELECTRONICS

The following electronics will be installed:

a. Radar

One Decca Model 202 radar

b. SSB Radio Telephone

A single side band radio transceiver which will have AM compatibility

c. VHF - FM Radio Telephone

A VHF - FM 10 channel radio telephone

23. INTERIOR COMMUNICATIONS SYSTEMS

The following interior communications systems will be installed:

a. Telephone System

b. Shaft RPM System

c. General Alarm System

d. Rudder Angle Indicator

e. Steering System Circuit

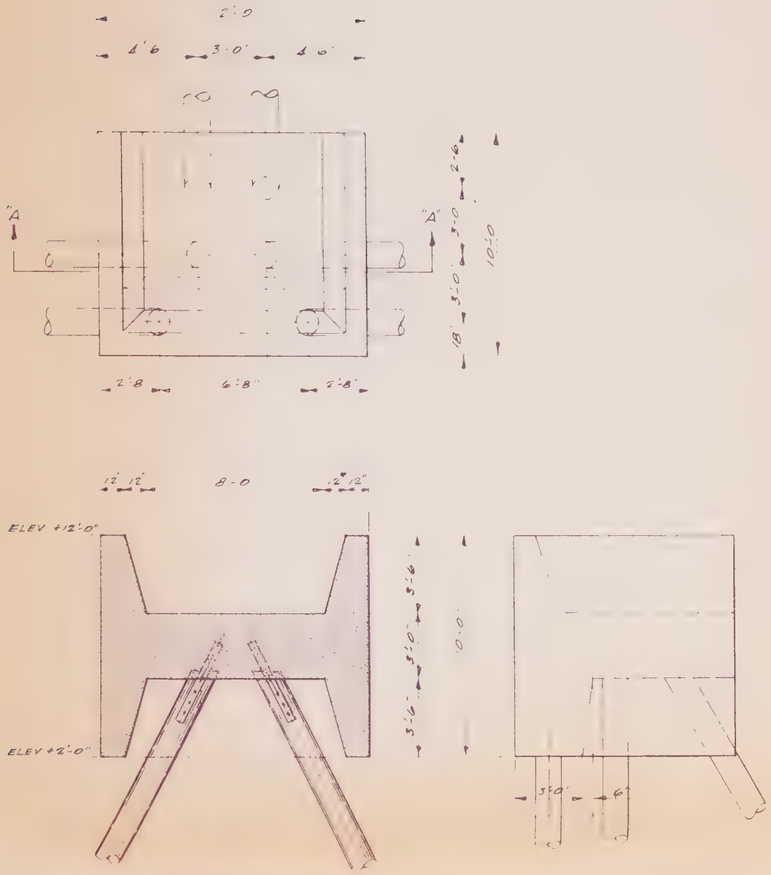
f. Engine Alarms

g. Announcing System

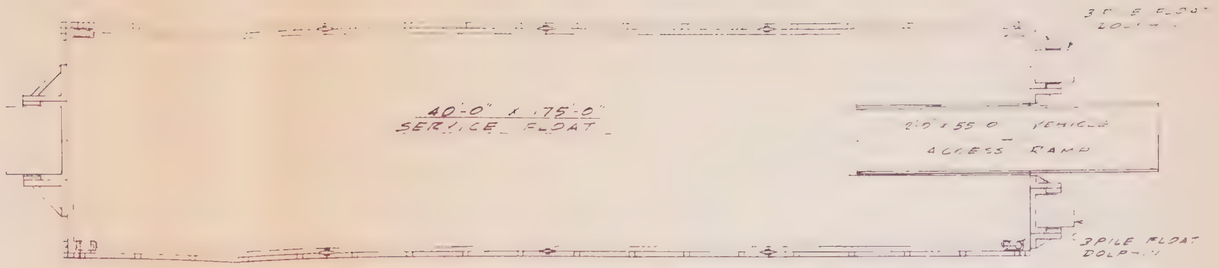
h. Turbine Controls

i. Whistle System

j. Docking Announcing System

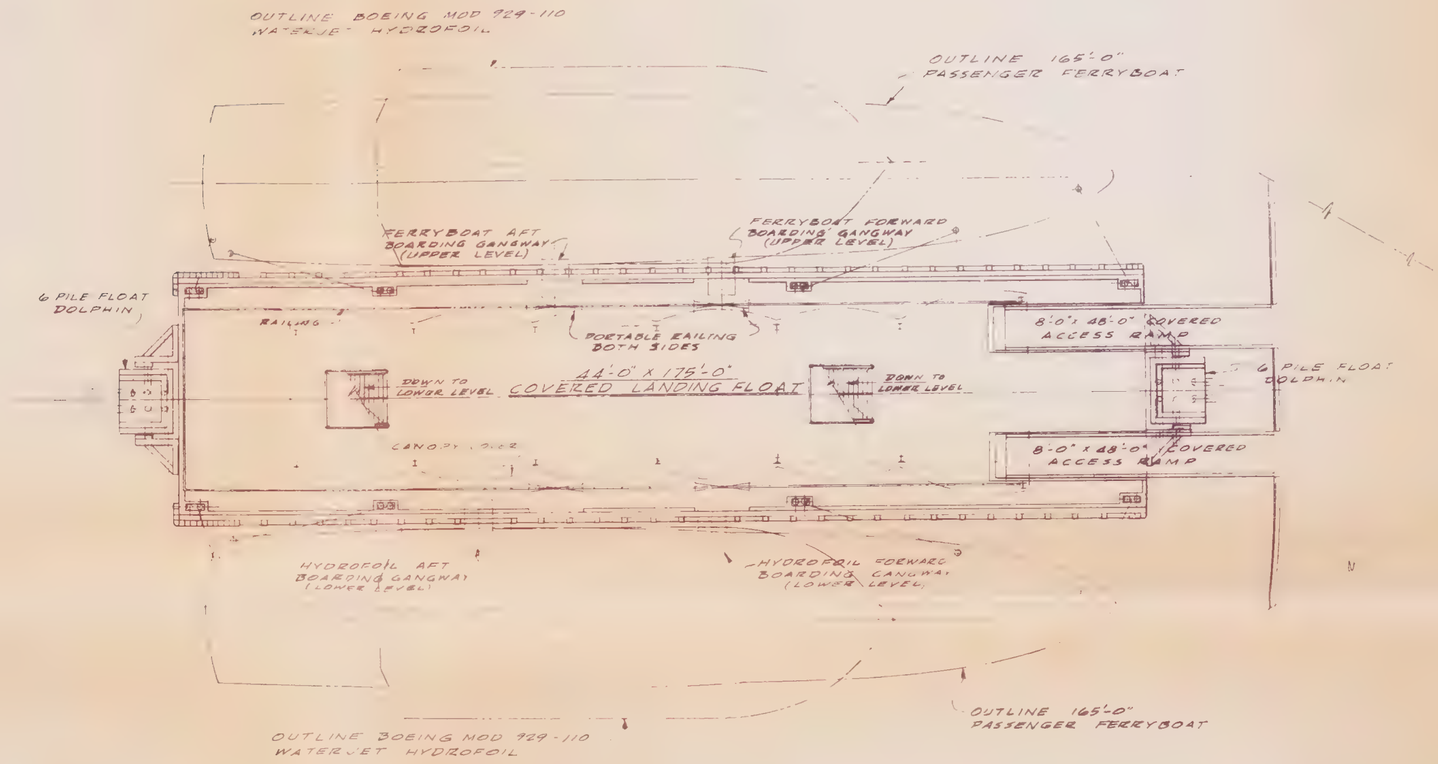


Typical Float Dolphin



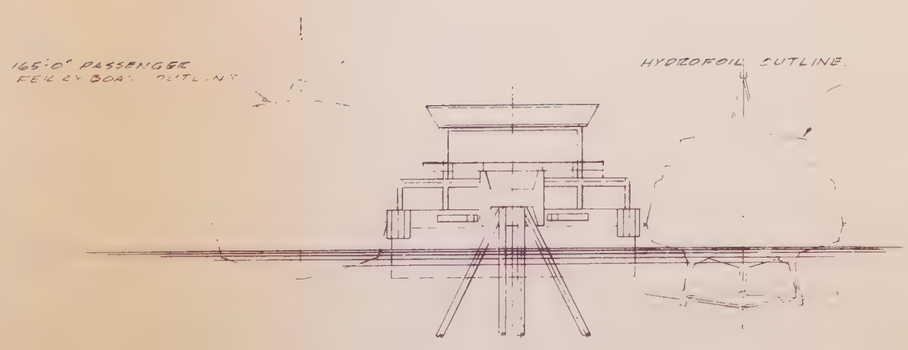
Plan View of Service Float

Side Elevation of Service Float

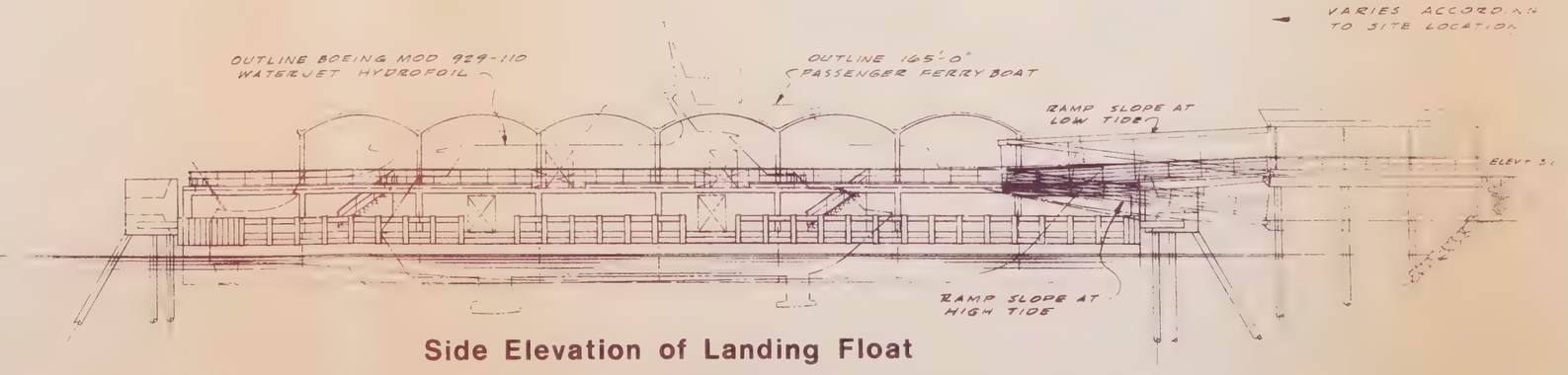


Plan View of Landing Float

SHOWING MOORING ARRANGEMENT.



Outboard End Elevation of Landing Float



Side Elevation of Landing Float

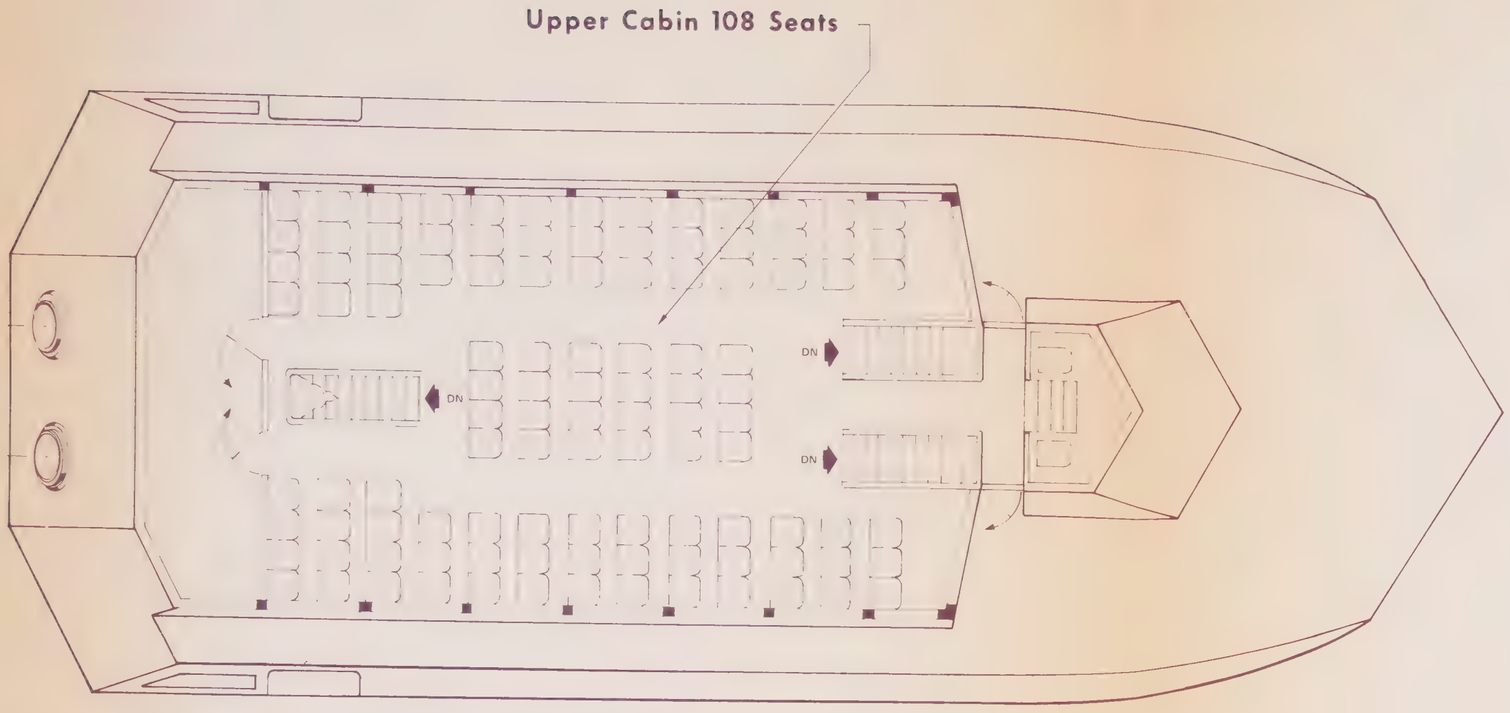
OUTLINE OF M.V. GOLDEN GATE NOT SHOWN BUT WOULD USE LOWER LEVEL FOR BOARDING PASSENGERS.

Typical Passenger Boarding Floats

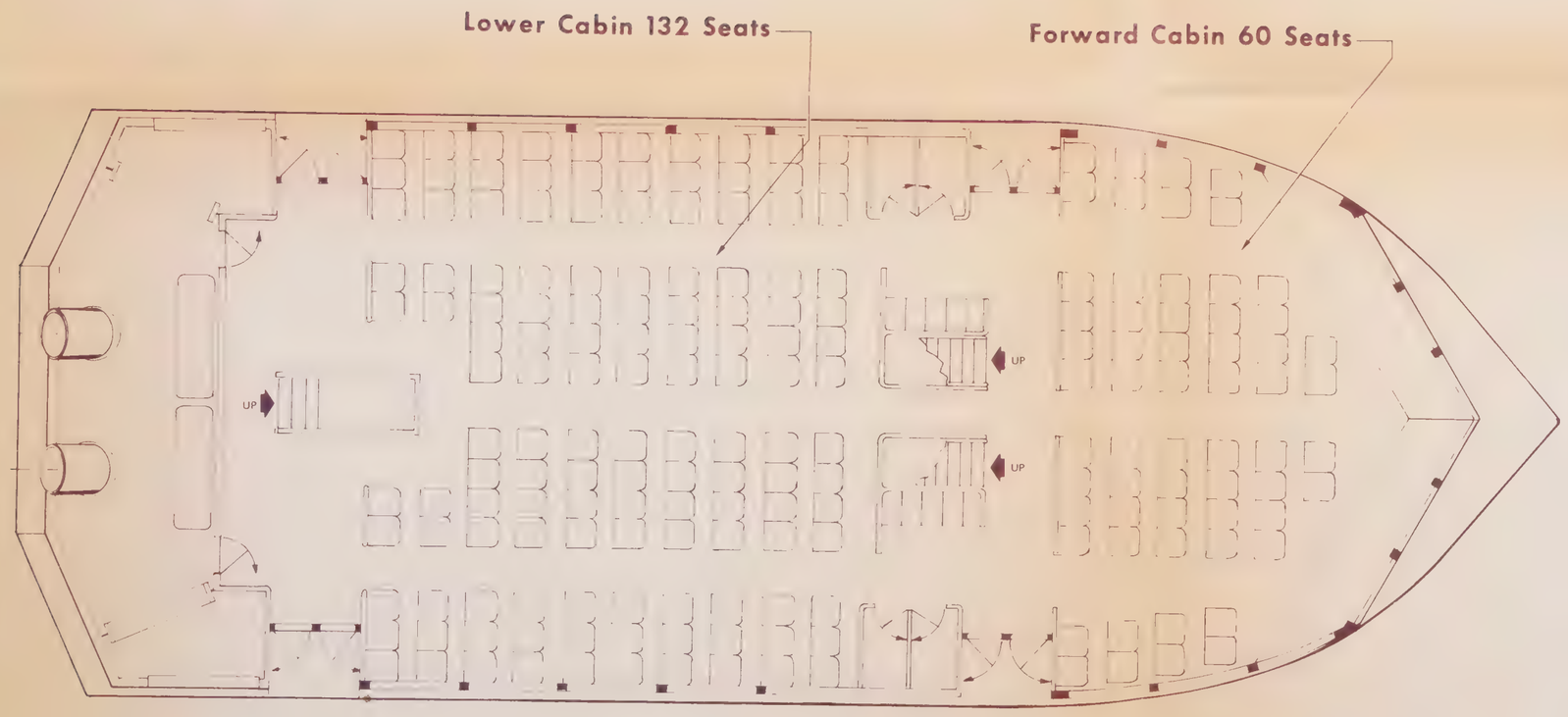
SCALE
0 4 8 16 32 48 feet

Philip F. Spaulding And Associates

Boarding Floats



Upper Deck Plan



Lower Deck Plan

BOEING MODEL 929–110

Passenger Capacity = 300

Length = 93 Feet

Beam = 35 Feet

Draft:

Foilborne 4.5 Feet

Hullborne 10.5 Feet

Propulsion:

Two 2,500 hp Gas

Turbine-Waterjets

Service Speed: 40 Knots

"929"

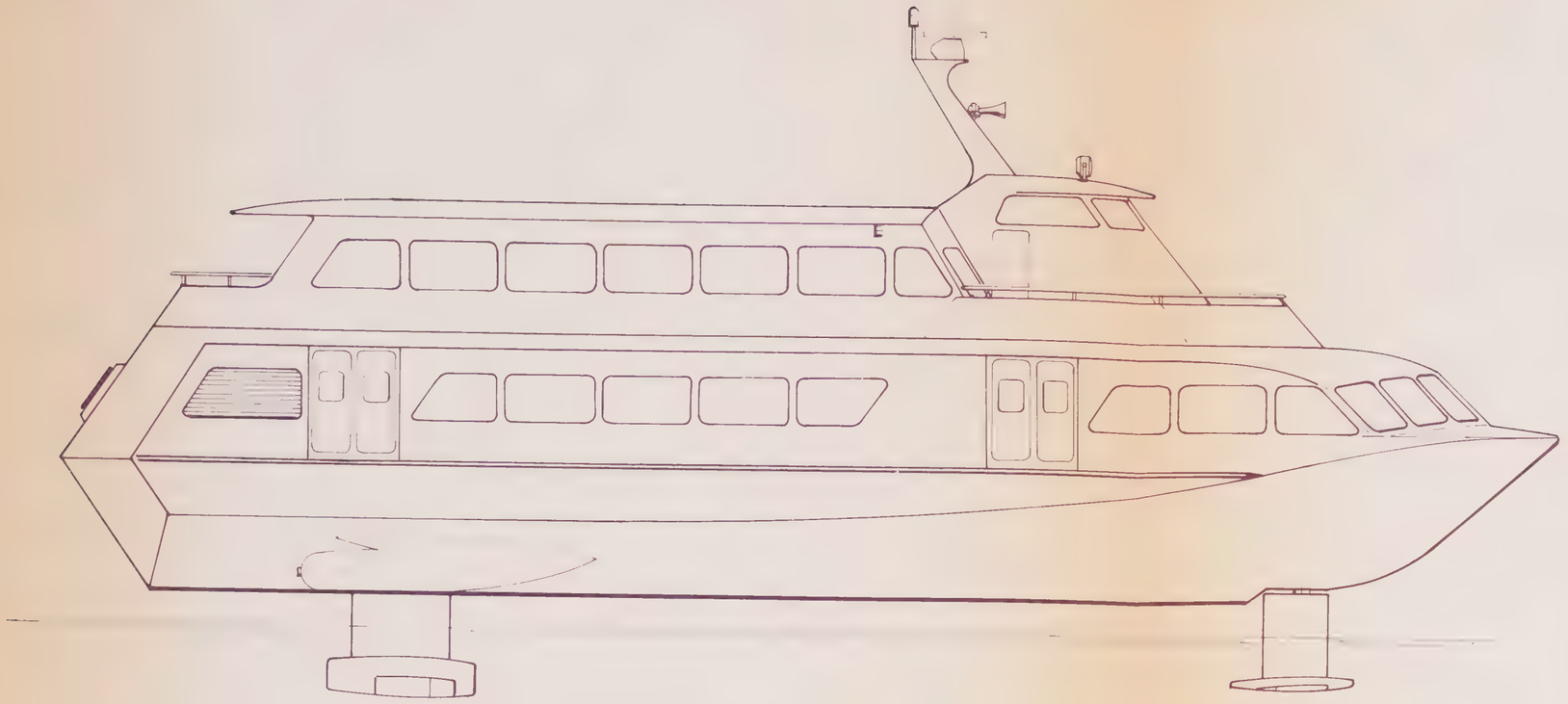
Waterjet Hydrofoil Boat Deck Plans

scale

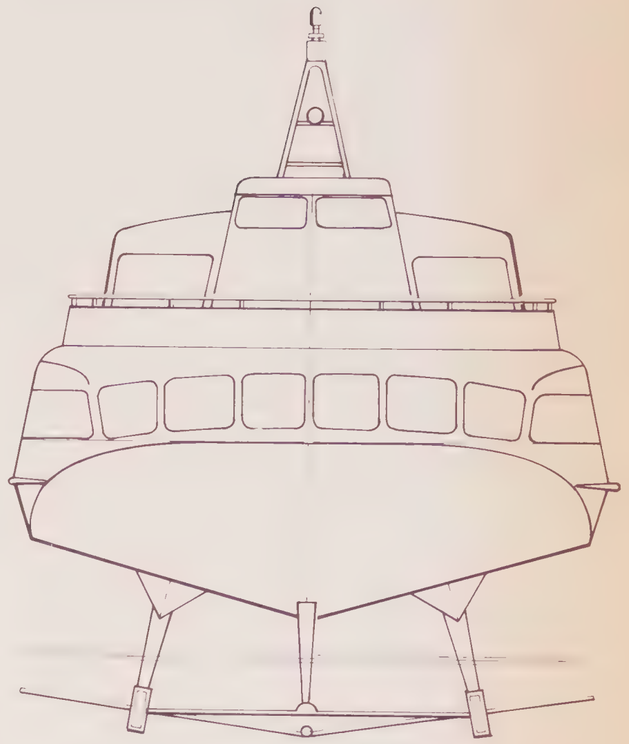
0 1 2 4 8 12 16 feet

THE BOEING COMPANY

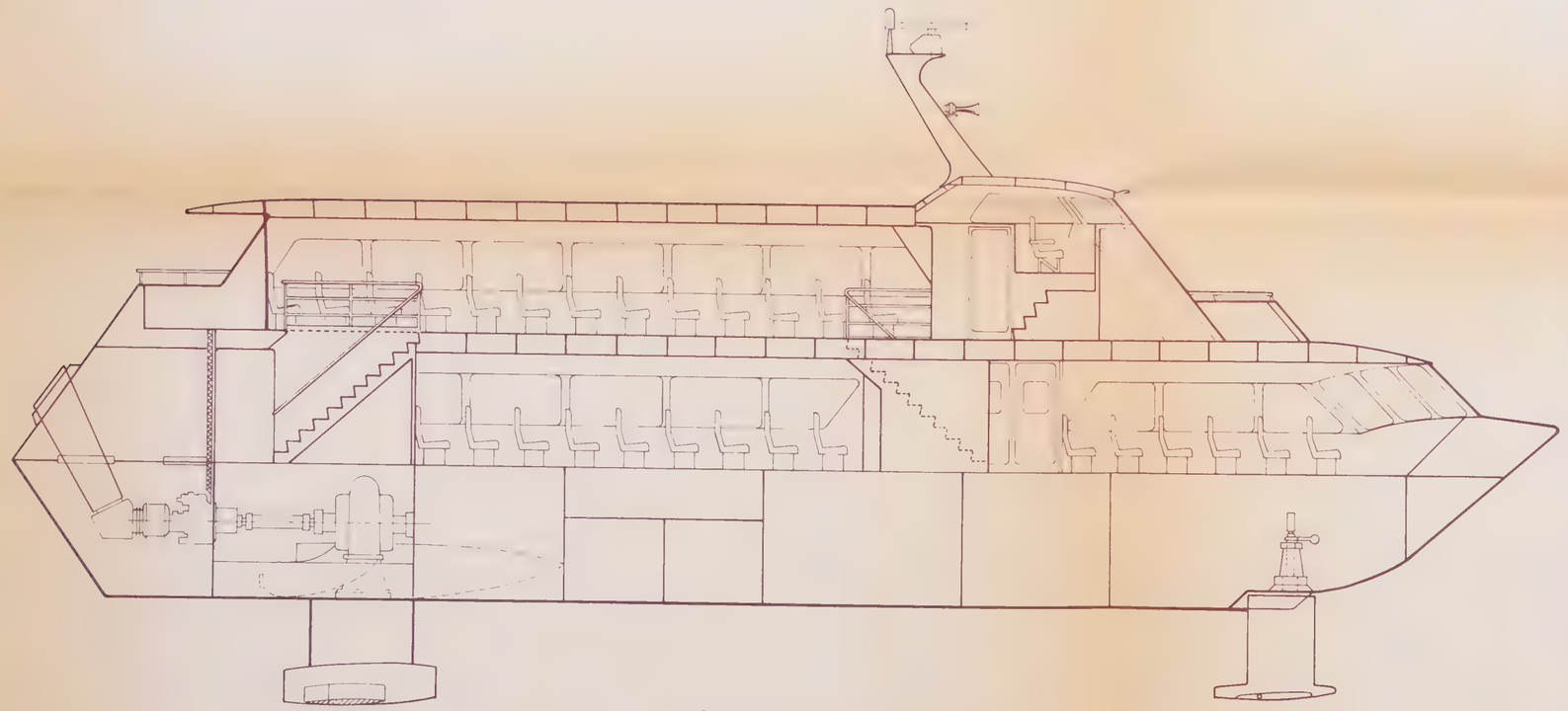
Boeing Hydrofoil
Deck Plans



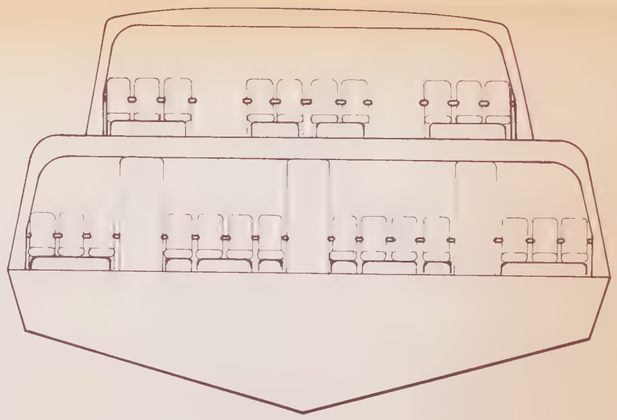
Outboard Profile



Bow Profile



Inboard Section



Midship Section

"929"

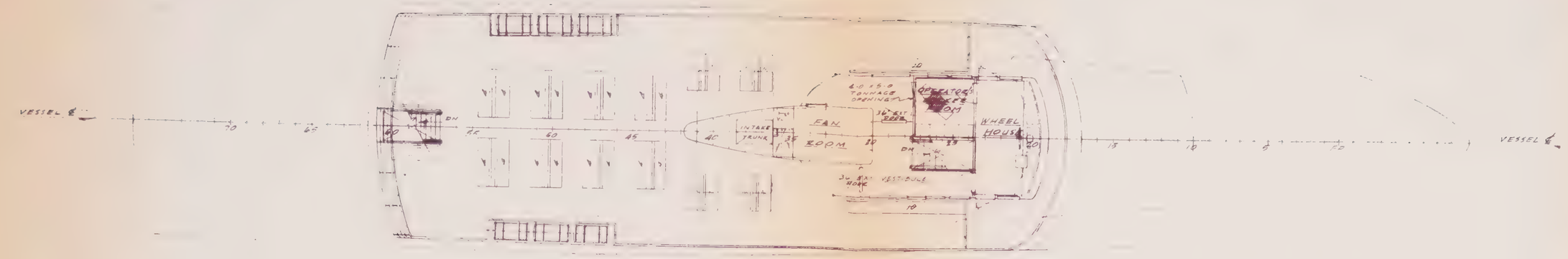
Waterjet Hydrofoil Boat Profiles and Sections

scale

0 1 2 4 8 12 16 feet

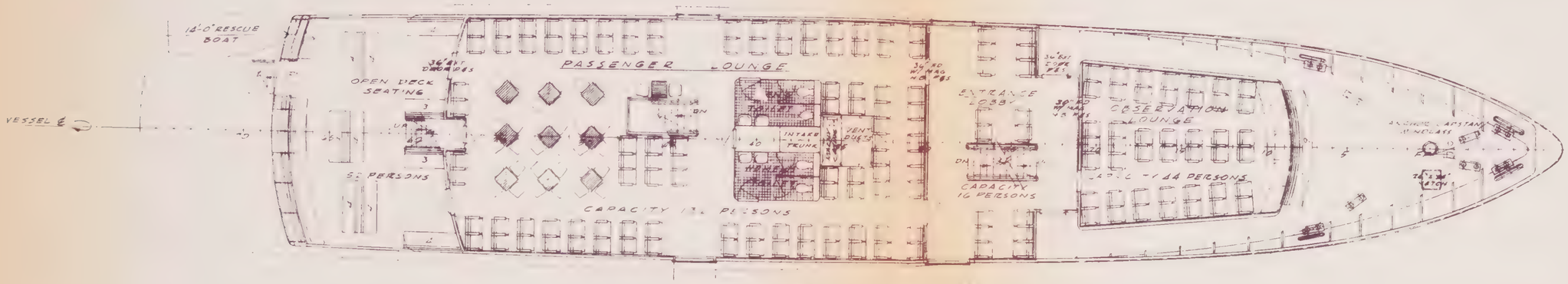
THE BOEING COMPANY

Boeing Hydrofoil
Profiles



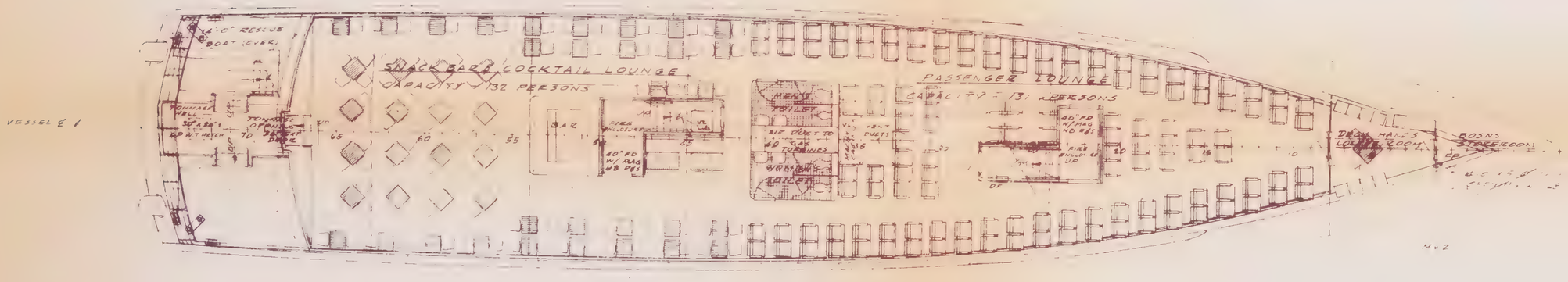
Sun Deck Plan

Outside Seating 116 Persons



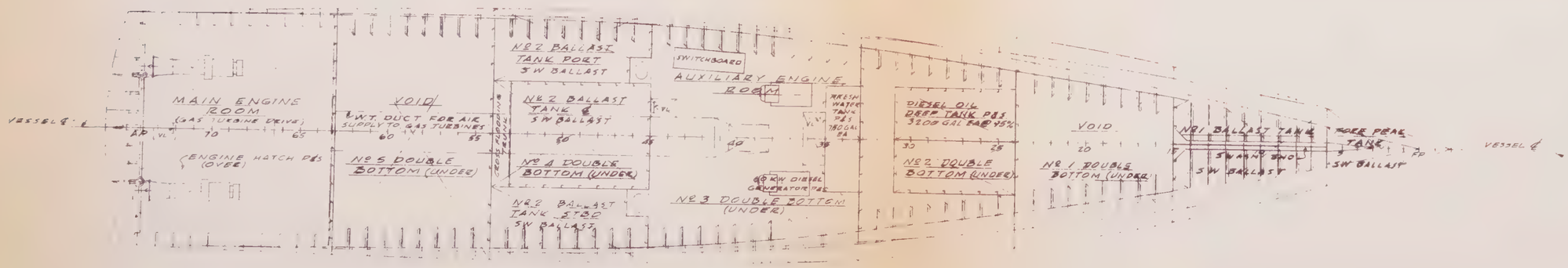
Upper Deck Plan

Inside Seating 196 Persons
Outside Seating 61 Persons
Total 257 Persons



Main Deck Plan

Inside Seating 263 Persons



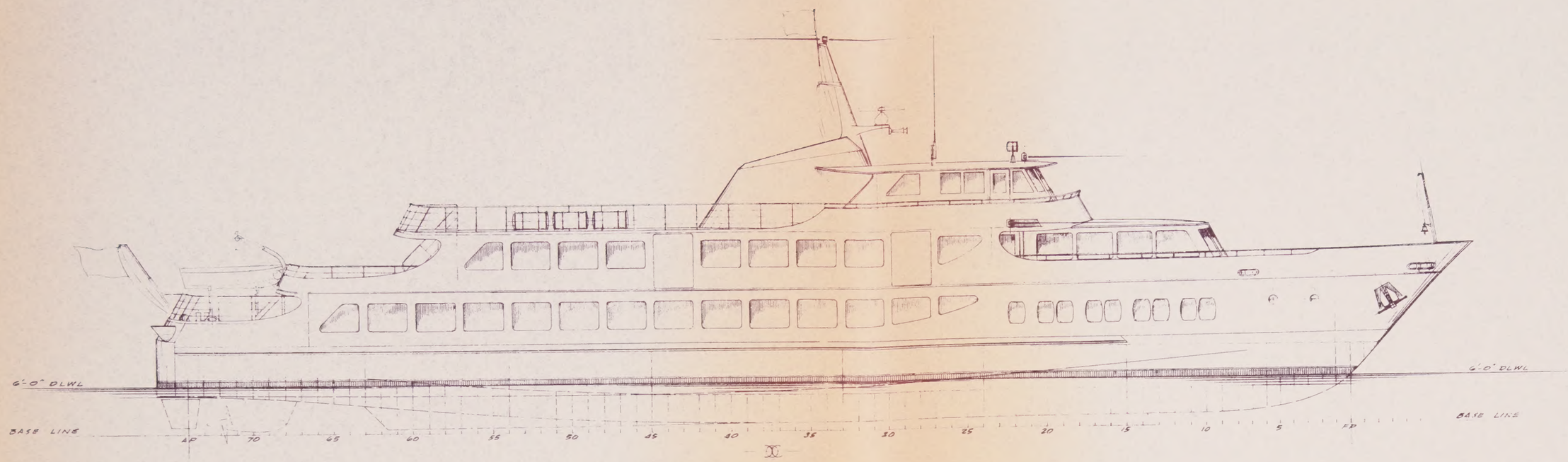
Hold Plan

Spaulding 165
Gas Turbine Passenger Ferry

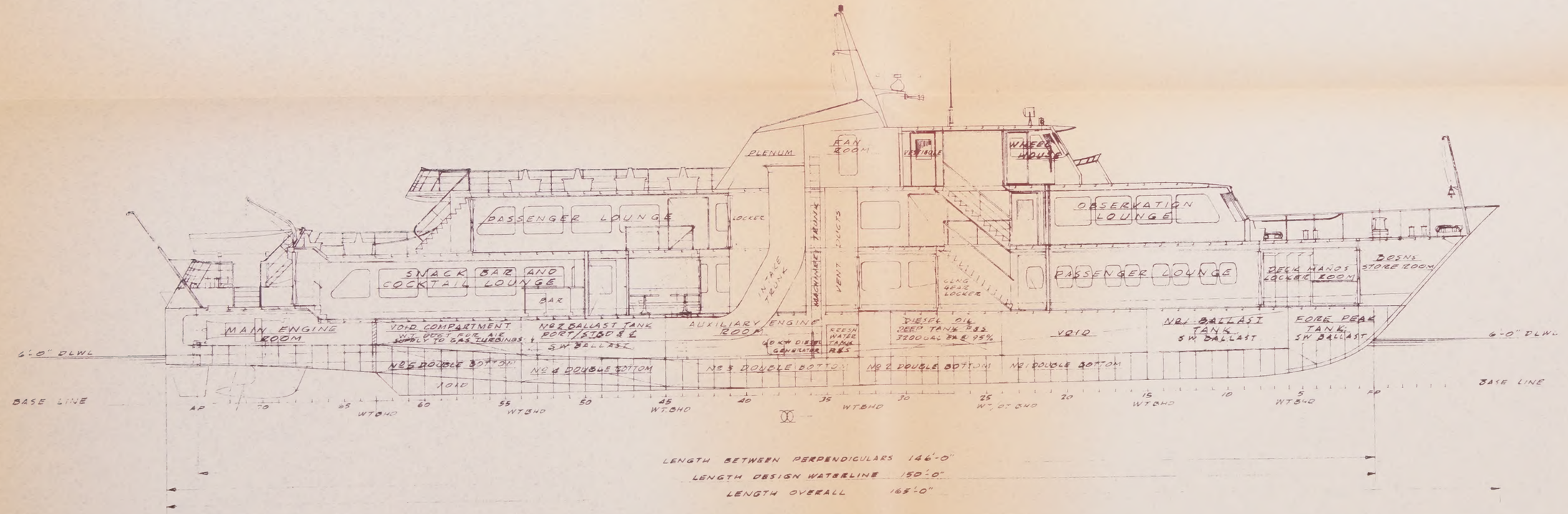
SCALE

0 2 6 10 20 30 feet

Philip F. Spaulding And Associates Inc.



Outboard Profile



Inboard Profile

Spaulding 165
Gas Turbine Passenger Ferry

SCALE

0 2 6 10 20 30 feet

Philip F. Spaulding And Associates Inc.